ENGINEERING AND MINING JOURNAL

A McGRAW-HILL PUBLICATION

SEPTEMBER 1956

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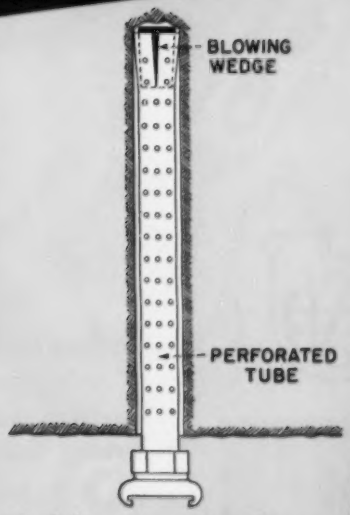
GIVE... the United way

UNITED

UNITED COMMUNITY CAMPAIGNS

Pelican's Progress—against an unfair tax. p 75



Holding a Roof—with cement. p 78

Show-in-Print—guide to AMC in Los Angeles. p 106

Canadians like efficient pumps too

CANADIAN AGENCY WITH WAREHOUSE STOCK

MINE EQUIPMENT COMPANY *Limited*

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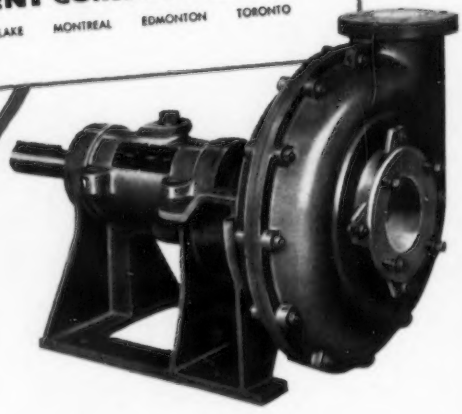

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Operating entirely without sealing water, this new split-shell, rubber-lined pump delivers the pulp UNDILUTED.

Except for the impeller and engine-side shell half-liner, it is identical with the

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Canadian mining and process industries are having their greatest surge in history. To meet their demand for improved pumping of abrasives and corrosives, A-S-H pumps are now made available, along with engineering service, through Mine Equipment Company, Limited, important Canadian addition to our round-the-world stocking agencies.

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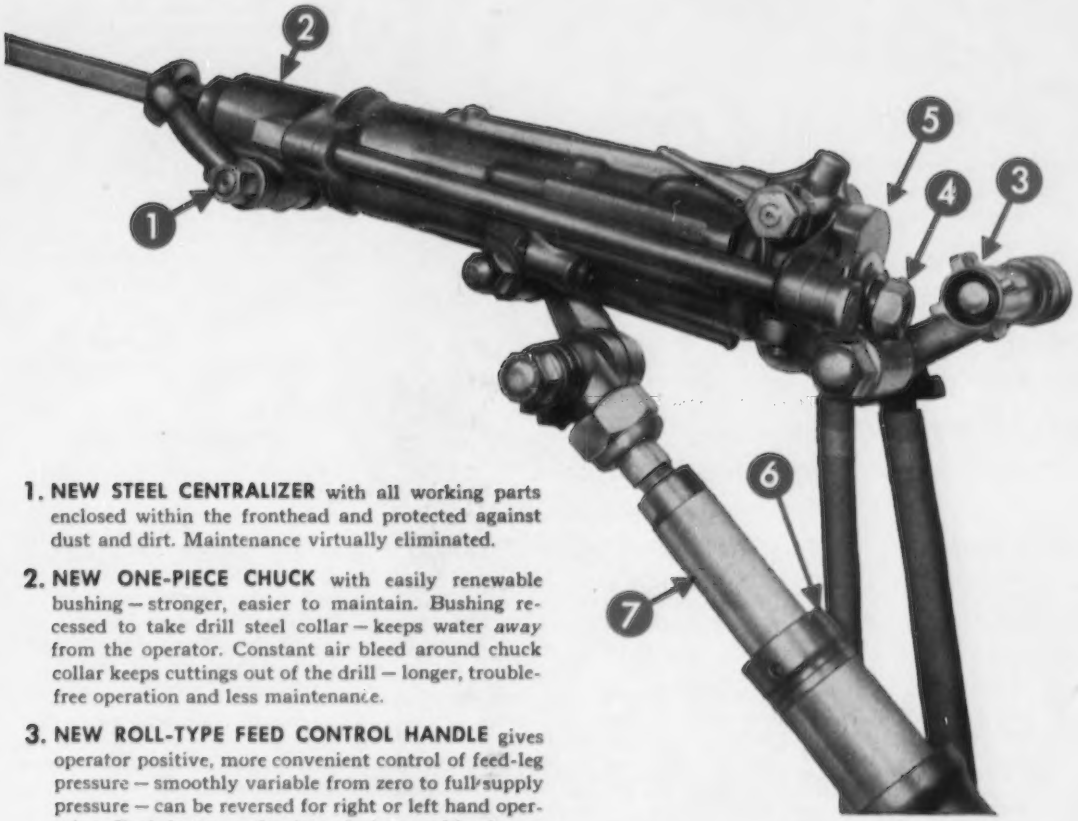
MAXIMIX RUBBER PROTECTED

new JR-38B JACKDRILL

has 7 improved features

for EASIER OPERATION & LESS MAINTENANCE



1. **NEW STEEL CENTRALIZER** with all working parts enclosed within the fronthead and protected against dust and dirt. Maintenance virtually eliminated.
2. **NEW ONE-PIECE CHUCK** with easily renewable bushing — stronger, easier to maintain. Bushing recessed to take drill steel collar — keeps water *away* from the operator. Constant air bleed around chuck collar keeps cuttings out of the drill — longer, trouble-free operation and less maintenance.
3. **NEW ROLL-TYPE FEED CONTROL HANDLE** gives operator positive, more convenient control of feed-leg pressure — smoothly variable from zero to full supply pressure — can be reversed for right or left hand operation. Push-button valve in end of control knob permits instant relief of feed pressure.
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6. **NEW EASIER DISMANTLING** of feed leg — saves maintenance down-time.
7. **NEW TELESCOPIC FEED LEG** is 10 pounds lighter in weight than previous design — makes Jackdrill easier to handle and transport.

WITH these new features, the I-R Universal Jackdrill is now better than ever — setting new standards of ease and economy — *it will stay underground.* It's not just a Jackhamer-Jackleg combination, but a completely integrated Jackleg Drill, with single air hose connection and all operating controls centralized on the drill backhead. Ask your Ingersoll-Rand representative for complete information on the time-saving, cost-saving features of the new and improved JR-38B Jackdrill. 5-409

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ENGINEERING AND MINING JOURNAL

90th YEAR OF PUBLICATION

VOL. 157 NO. 9

SEPTEMBER 1956

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LETTERS

Revise on Royalty

On page 107 of your Mid-June Mining Guidebook issue, you make the statement that in Heavy-Media Separation processing "if you use ferrosilicon media process you will have to pay a royalty to American Cyanamid Company."

American Cyanamid Company acts as technical and sales representative for the exclusive licensors of the Heavy-Media Separation patents, the American Zinc, Lead and Smelting Company. Cyanamid also negotiates licenses on behalf of American Zinc with the users of these processes. However, the licensor is the American Zinc, Lead and Smelting Company and not Cyanamid. Therefore, royalties are paid to American Zinc.

In addition, there is a large group of Heavy-Media patents and not only one patent as you indicated. If the Heavy-Media user has a plant which involves the art covered in any of these patents, royalties will, of course, be payable to the licensor, irrespective of the type of magnetic media used.

F. W. Bloecher Jr.
Mineral Dressing Dept.
American Cyanamid Co.
New York 20, N. Y.

Information Please

As we are interested in the future development of the Gardner hydraulic ore hoist system, we would be very grateful to you if you could inform us of the experiences that would be engaged in the future, giving the details and information which could have been gathered.

F. Suys, Directeur-Adjoint
Union Miniere Du Haut-Katanga
6, Rue Montagne du Parc
Bruxelles, Belgium

● Can you help Mr. Suys out on this? If you have information concerning further development of this system, please let's hear from you.—Ed.

Street Out of Place

May we draw your attention to a misprint of our address on page 106 of the May issue where Portland Street is given instead of Portland Place.

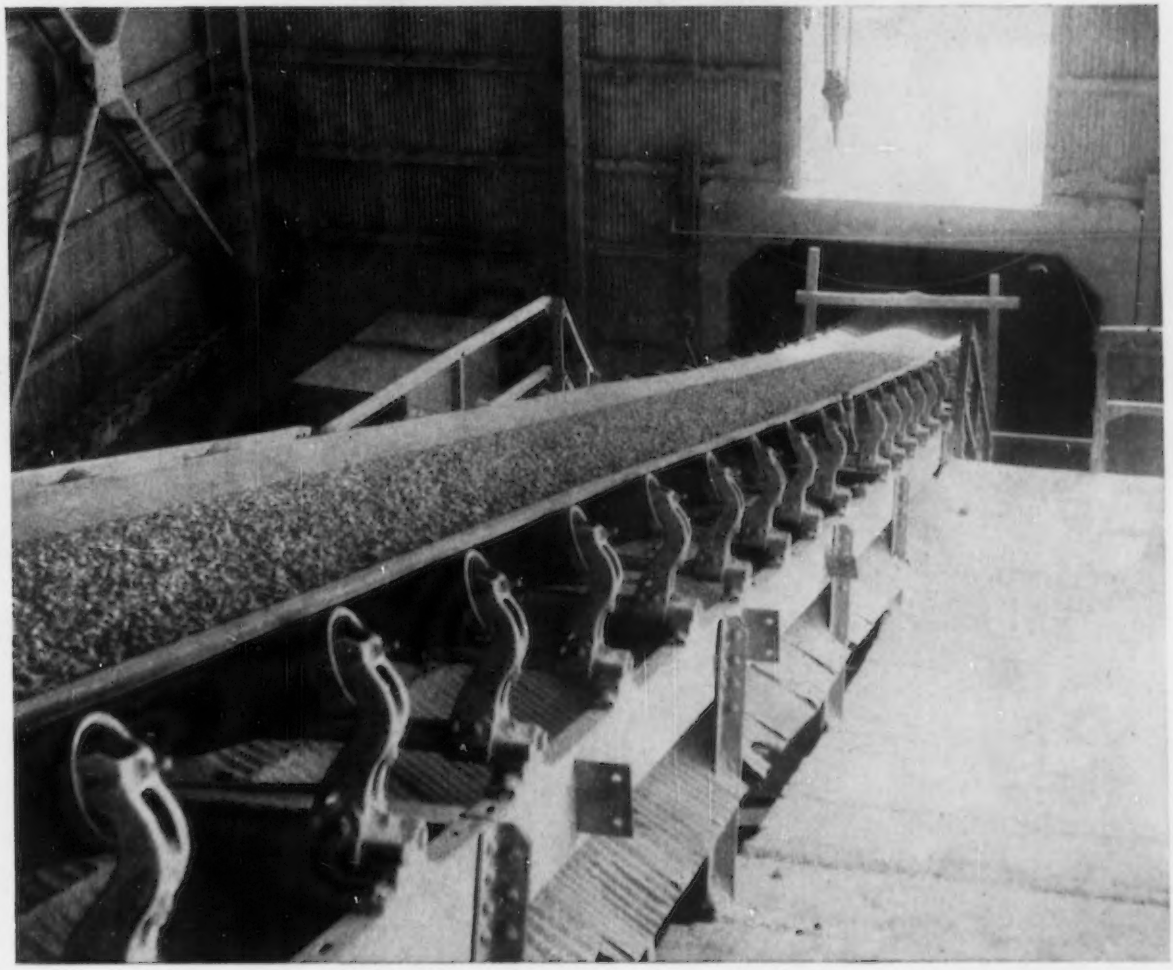
L. Corbett, Librarian
Institution of Mining & Metallurgy
London, W. 1, England

Percentage of TiO_2

Your article on titanium manufacture by Mr. Mastin in the June issue of *Engineering & Mining Journal* was most interesting. However, the average TiO_2 content of ilmenite as quoted (20 to 25%) is certainly erroneous. The TiO_2 content of ilmenite normally ranges from 45 to 60%.

Monroe M. Solomka
Gran Via, 66
Bilbao, Spain

B.F.Goodrich



85 million tons handled at belt cost of 9¢ per 1000 tons

MORE than 85 million tons of copper ore have ridden that B. F. Goodrich conveyor belt since it was first installed 17 years ago at the Chile Exploration Company, Chuquicamata, Chile.

In all that time the belt has cost the company less than $180 for repairs. And the company reports it still looks good for two more years! Here are some of the reasons for the long life, low maintenance costs.

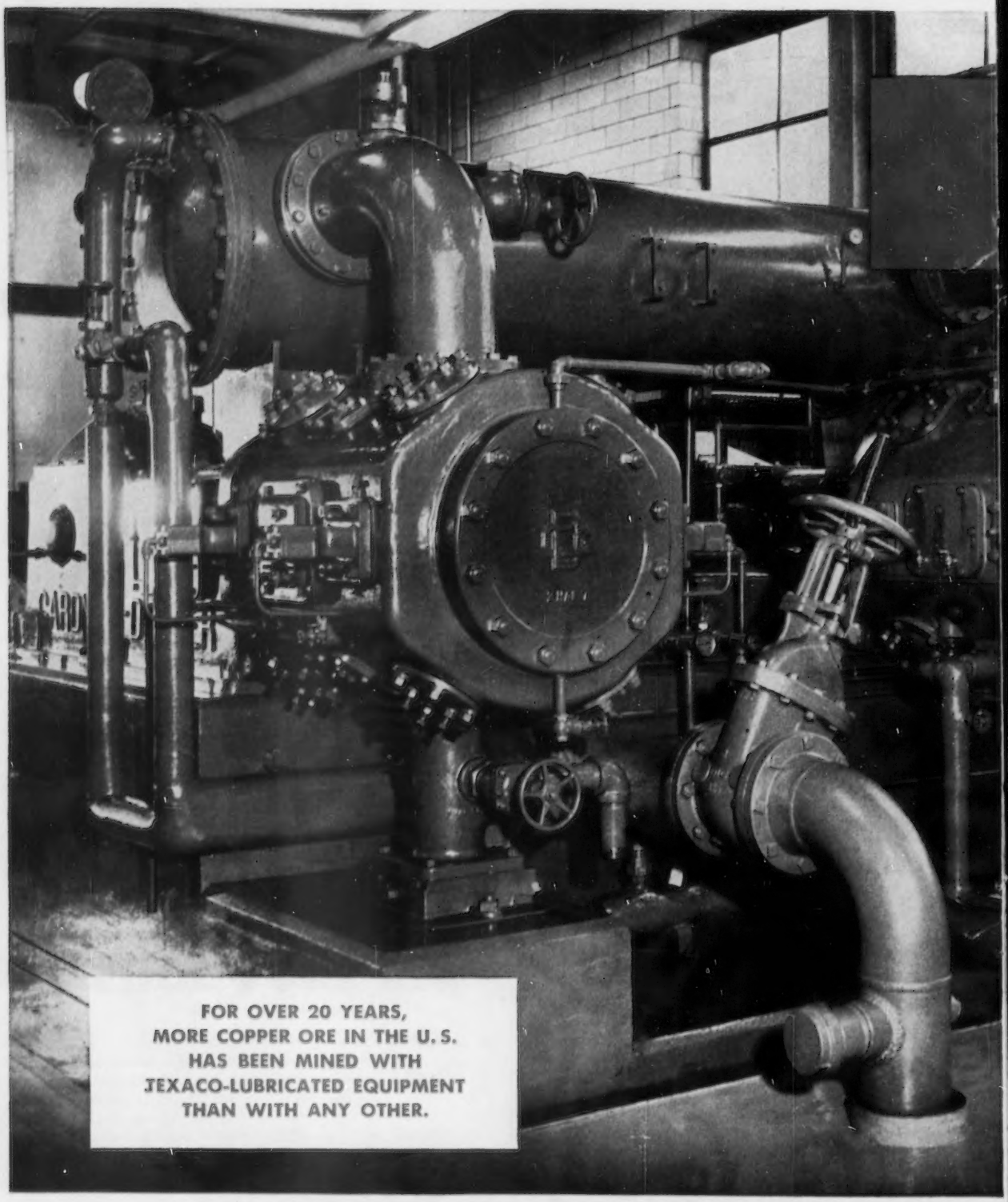
The square-edge construction, found only in B. F. Goodrich belts, insures greater flexibility, helps the belt travel more easily, with less strain, less wear. This is because each ply of fabric runs only from one edge of the belt to the other. Edges are bonded, won't separate. Belt troughs perfectly whether loaded or empty.

Special chemicals, developed by B. F. Goodrich, are added to the rubber to keep it "live" and elastic, help it resist the effects of age, sun and weather. Belts are made under uniform tension, so that all fibers work together; seamless plies are used to avoid weak spots; patented layers called "breakers" are added to stand hard blows; mildew treatment is included to protect fabric.

This is why so many B. F. Goodrich belts—like the one in the picture—have far outlasted other medium-priced belts, and have cut the costs of hundreds of industrial operations. Let your B. F. Goodrich distributor show you how to get the best conveyor belt service for the lowest possible cost. *B. F. Goodrich Industrial Products Company, Dept. M-717, Akron 18, Ohio.*

B.F.Goodrich

INDUSTRIAL PRODUCTS



TEXACO

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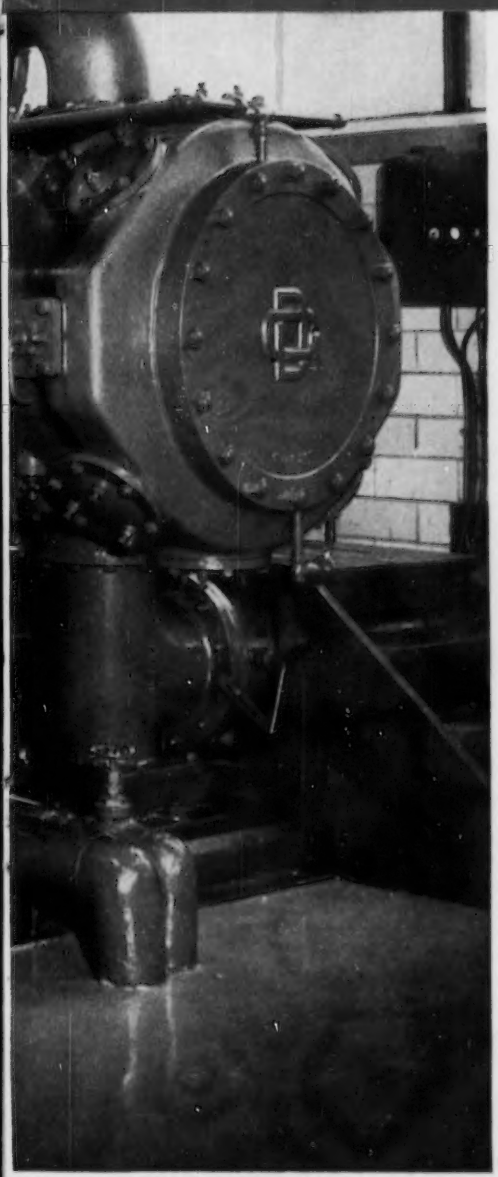
GET FREEDOM FROM DEPOSITS AND RUST



CLEAN OPERATION, freedom from deposits and rust—you can count on those benefits when you lubricate your air compressors with *Texaco Regal Oil R&O.* And you'll enjoy full operating efficiency and consistently low maintenance costs.

Texaco Regal Oil R&O is a very special oil, ideal for air compressor lubrication. It is made from choice stocks, carefully refined and fortified with special rust and oxidation inhibitors. It has exceptional ability to lubricate effectively and to prevent harmful deposits.

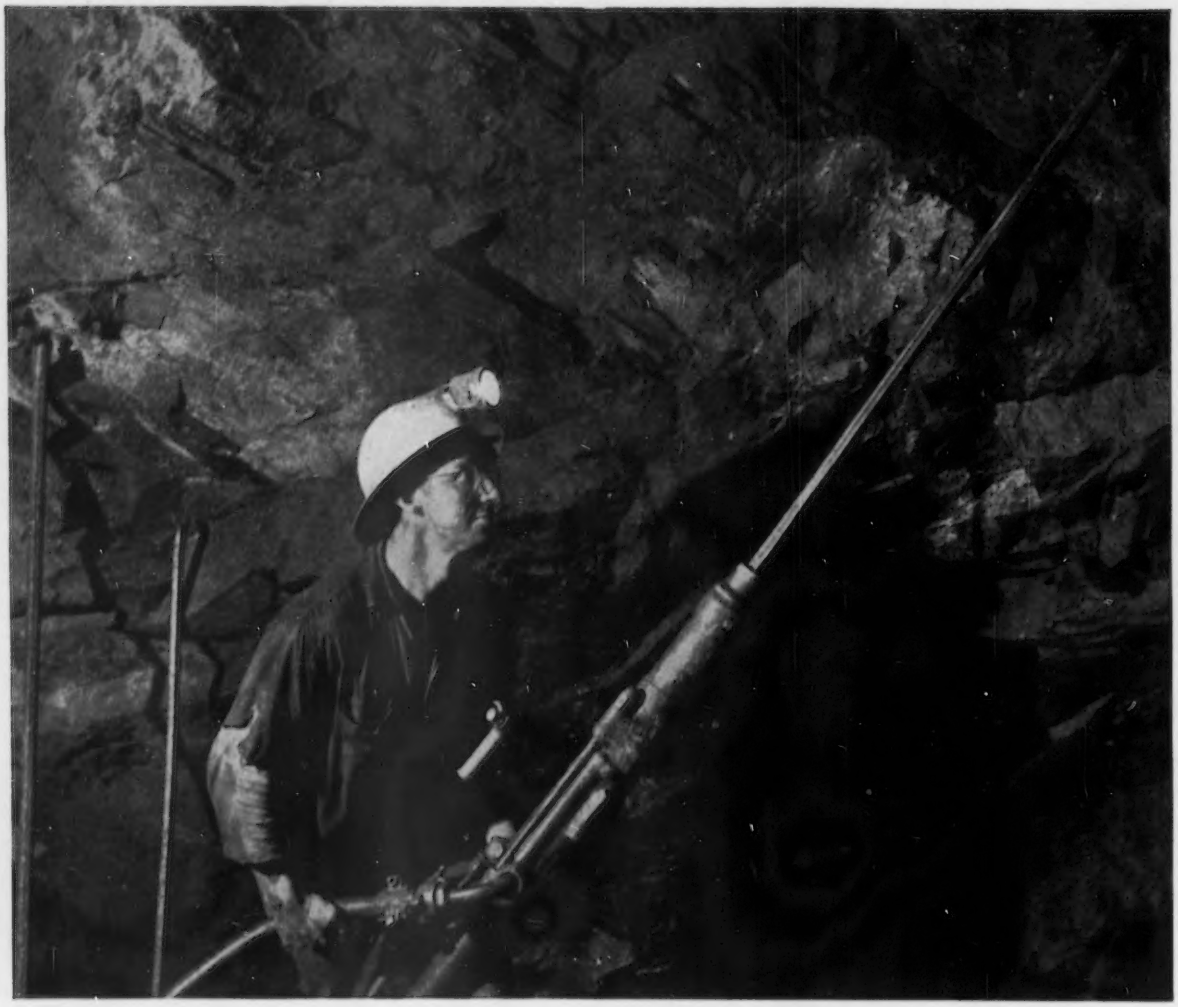
There is a complete line of *Texaco Regal Oils R&O.* You can get one exactly right for any compressor . . . whatever its size, type, or pressures involved, whatever the operating conditions.

For your drills, use *Texaco Rock Drill Lubricant EP.* It assures protection against wear, and prevents rust whether drills are running or idle.

A Texaco Lubrication Engineer will gladly help you select the proper lubricants for all your equipment. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

The Texas Company, 135 East 42nd Street, New York 17, N. Y.

Lubricants and Fuels
FOR THE MINING INDUSTRY



They're Drilling Hard Rock at the Richard Ore Mine

There's some interesting hard-rock drilling going on these days at the Richard Ore Mine of The Colorado Fuel and Iron Corporation. This iron-ore mine, located in gently rolling country at Wharton, N. J., has abundant deposits of magnetite, gneiss and granite—tough going for drilling crews.

To make effective headway against these types of rock, a large proportion of the blast holes are being drilled with Bethlehem Hollow Drill Steel. The Bethlehem Hollow, in 1-in. hexagons and 1¼-in. rounds, is fitted with carbide-insert bits, and is used in jackhammers, stopers and jumbos. In general, blast holes are 6 ft or 8 ft deep. Reconditioning is done top-side, in the mine's own shop.

For any type of hard-rock drilling, you can count on minimum breakage with Bethlehem Hollow. This is because it is rolled from a tough grade of fatigue-resisting steel. Its wide quenching range makes it easy to heat-treat for the proper balance of toughness and wear-resistance, while providing long-wearing threads and tough shanks.

Bethlehem Hollow is good, hard-working drill steel. It comes in carbon and ultra-alloy grades in rounds, hexagons and quarter-octagons, and in popular lengths of from 18 ft to 25 ft. Longer lengths can be supplied for special requirements.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM HOLLOW DRILL STEEL CARBON AND ULTRA-ALLOY

BETHLEHEM STEEL

We look forward to seeing you at
BOOTH 837
AMERICAN MINING CONGRESS CONVENTION
Los Angeles, Oct. 1-4

THE SHARPLES SUPER CLASSIFIER

The Ideal Air Vortex Classifier for all Types of Powders

- **Ultra-sharp cutpoint with high capacity**
- **Cutpoint unaffected by throughput rate or size distribution of feed**
- **Unmatched efficiency**
- **Increased production with higher product quality**

The Sharples Super Classifier is achieving heretofore unattainable standards of performance in the classification of dry powders. A copy of Sharples Bulletin 1280 will be sent upon request.

See also two Sharples Wet Classifiers and the Sharples Micromerograph Particle Size Distribution Analyser.
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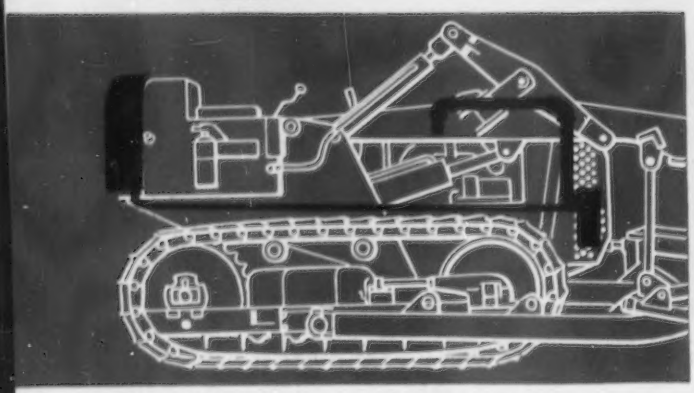
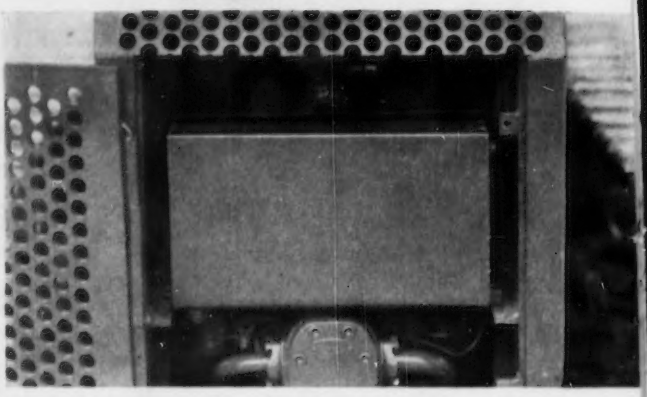
NEW International® TD-9

See it AT THE Mining Show



Compact, stainless steel scrubber is mounted neatly behind the radiator guard. No external "plumbing." Engine cooling is unaffected. Owner gets maximum 71 net hp. Scrubber cools exhaust gas from about 1000° F. to maximum 160° F., also removes harmful irritants.



Scrubber and diffuser are easily accessible for servicing by opening radiator guard door. Diffuser breaks up cooled exhaust gas...regular engine fan blows air through gas at a ratio of 25-30 to 1, rendering final exhaust gas harmless to personnel, minimizing fire hazard.

NOW...get unmatched versatility underground with Drott special attachments

Exclusive Drott Four-In-One is a dozer, bucket, clamshell, and bulklam all in one ...a versatile utility tool for loading and clean up.

95-inch Drott bulldozer blade mounts directly onto Skid-Shovel lift arms. Depth of cut regulated by hydraulic control of blade pitch.

Drott angledozer blade ditches, slopes, dresses...can be set to either side. Operator tilts blade from seat.

Rock fork constructed of super-strong alloy steel . . . withstands abrasion of loading hard, tough minerals.

Third, extra valve of Drott Skid-Shovel, controls rear-mounted heavy-duty scarifier . . . for tearing up ore beds.

Low profile, 2-prong grapple with top grab arm loads ties with full control.

Pallet fork lift attachment has two adjustable prongs for mounting of platform for drill jumbos or roof bolting.

Underground Mining Tractor

featuring...

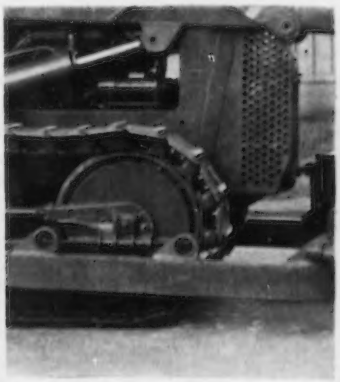
- **New, compact, exhaust gas scrubber... safe, integrally mounted!**
- **New 24-volt direct electric starting!**
- **New, low 6-foot height!**
- **Plus a complete line of interchangeable International Drott mining equipment!**

Now, International Drott announces a new crawler tractor completely designed and equipped for underground mining operations! Unusually compact and clean in design, the new tractor meets the U. S. Bureau of Mines' new safety standards for non-coal operations. It features the new Drott short-coupled, built-in exhaust gas scrubber and cooler. A new exhaust gas diffuser works together with the regular engine blower fan. And it has a new 24-volt, direct electric starting International diesel engine.

The new tractor has been lowered to 6 ft. to permit safe transport on low rail beds under low trolley wires. *Its length has not been changed* by the addition of scrubber and water reservoir tank.

The new TD-9 offers unmatched versatility and flexibility. It takes the standard 1½ cu. yd. Drott shovel, plus a narrow 46″ shovel for tram car loading, straight and angledozer blades, special buckets, and the exclusive Four-In-One. Be sure to see the remarkable new TD-9 at the American Mining Congress.

Large 40-gallon capacity reserve water tank is mounted behind fuel tank, does not extend beyond drawbar. Capacity is sufficient for full eight-hour shifts. Level of water in scrubber is maintained at 4 inches by a stainless steel float.



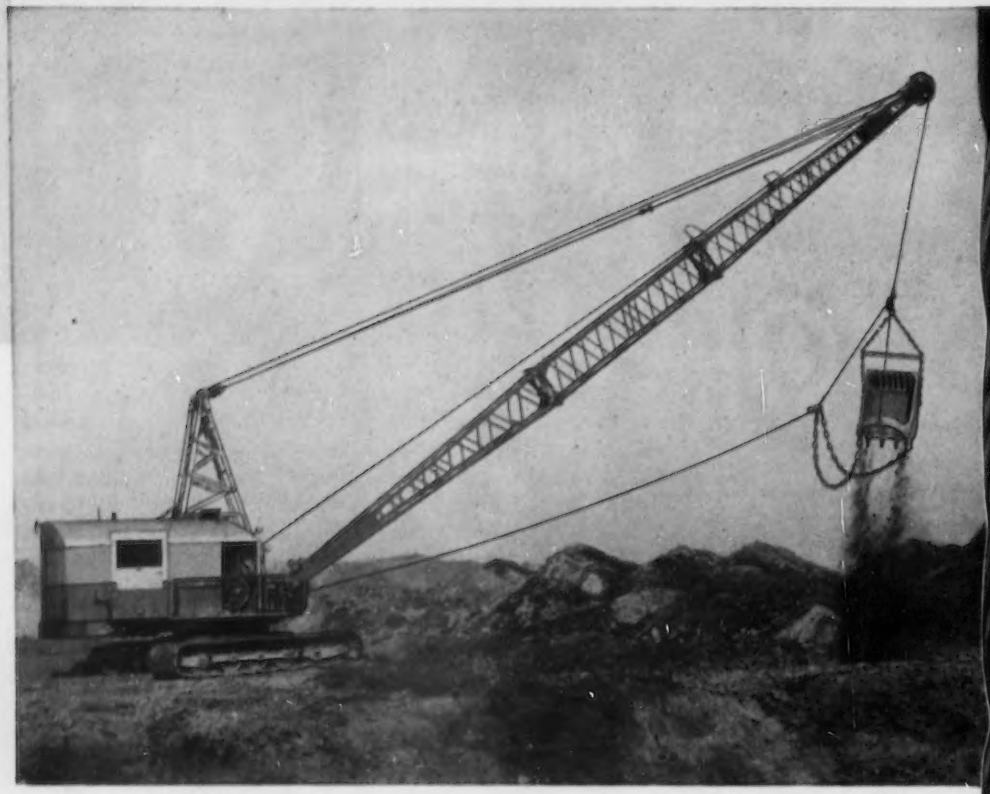
For extremely heavy duty work, International bulldozer or bullgrader blades with separate outside push frames are also available.

INTERNATIONAL HARVESTER

INTERNATIONAL® Construction Equipment

International Harvester Company, 180 N. Michigan Avenue, Chicago 1, Illinois

A COMPLETE POWER PACKAGE INCLUDING: Crawler, Wheel, and Pipe-Boom Tractors . . . Self-Propelled Scrapers and Bottom-Dumps . . . Crawler and Rubber-Tired Loaders . . . Off-Highway Trucks . . . Diesel and Carbureted Engines . . . Motor Trucks



New VHS Dragline Lasts 58% Longer ...at Keller Mines

• Mr. John Oreskovich, Superintendent of Keller Mines, Inc., Beloit, Ohio says: "9 to 12 days used to be about all the life we could expect from the best Improved Plow Steel draglines on this Lima 1201 excavator. However with new VHS we are getting from 19 to 24 days—increasing service life from 58% to over 100%. Naturally we have switched to VHS on every piece of equipment for which a VHS line is made."

Service records like this are becoming commonplace in the mining industry. For new tougher VHS resists abrasion . . . keeps its shape under pressure . . . can't become "hide bound" or lose its flexibility. Developed specifically for draglines, slusher ropes and shovel hoist ropes, it stands up better in these toughest of wire rope applications.

Cuts "Down Time," Saves Money—The longer life you get from new VHS saves you money. And you make additional savings by cutting costly "down time" of equipment for wire rope replacement.

Stronger Too—New VHS, made from a new grade of steel for wire rope, is at least 15% stronger than Improved Plow Steel—the strongest grade available before the introduction of VHS. This means you can handle heavier loads with the same diameter line. And you have a higher factor of safety . . . additional insurance against sudden overstresses.

Easy to Order—You don't need any complicated specifications to order new VHS. Just call your Hazard distributor and ask him for a VHS dragline, shovel hoist rope or slusher rope in the size you want. He has it in stock.

For more information see your Hazard distributor salesman or write to the nearest Hazard office for Bulletin DH-513H

HAZARD WIRE ROPE DIVISION
American Chain & Cable Company, Inc.
Wilkes-Barre, Pa., Atlanta, Chicago, Denver, Houston, Los Angeles, New York, Odessa, Tex., Philadelphia, Pittsburgh, Portland, Ore., San Francisco, Bridgeport, Conn.

LAY-SET VHS

15% Stronger • Tougher • More Wear-Resistant

BIGGEST CUT IN U.S. ROAD-BUILDING HISTORY

TO HELP BREAK CALIFORNIA BOTTLENECK

SECOND ONLY TO THE PANAMA CANAL in earth-moving magnitude, this 8½-million-yard cut will result in a canyon 1,370 feet wide and 350 feet deep at San Francisco's Carquinez crossing. Although much rock is being encountered, blasting is kept to a minimum and rippers and scrapers help keep the pace close to 30,000 yards per two-shift day! Goodyear 3-T Nylon Cord HARD ROCK LUG tires are taking this tough job in stride.

HOIST EQUIPPED RIGS make quick work of tire maintenance — help cut tire-cost-per-yard to new lows.

Another bottleneck broken!

TUBE AND FLAP TROUBLES ENDED FOREVER

with Triple-Tempered 3-T Nylon Cord

TUBELESS TIRES!

AIR DOESN'T SEEP THROUGH 3-T CORD BODIES — and Goodyear's mounting program is quick, safe, airtight, from smallest to largest sizes.

That's why Goodyear TUBELESS tires and rims are standard on foremost original equipment—and can be specified for *all* equipment.

But there's no need to wait. You can get all regular Goodyear features—plus the following TUBELESS advantages by changing over present equipment NOW:

No tube or flap troubles! No tube replacements! Easier mounting! Airtight assembly! Cooler running! Slow leaks instead of blowouts! Easier repairs! Simpler, re-usable valve parts! Simply contact your Goodyear dealer. Goodyear, Truck Tire Dept., Akron 16, Ohio.

NOW IN 3-T NYLON CORD — TUBE-TYPE OR *TUBELESS!*

Look for this nearby Goodyear dealer sign for better tire values—better tire care.

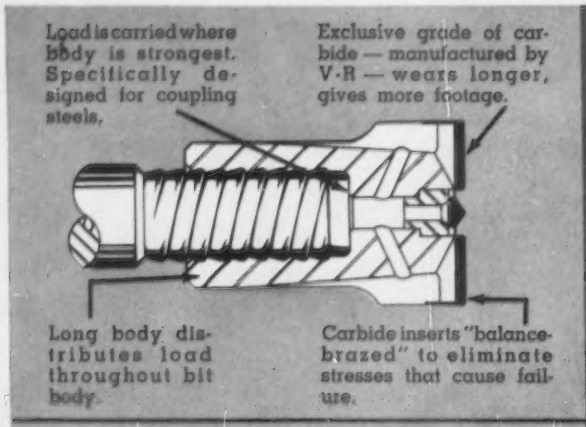
Buy and Specify

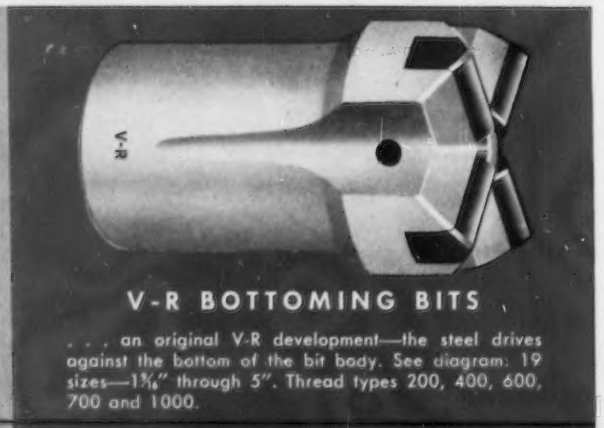
GOODYEAR

MORE TONS ARE HAULED ON GOODYEAR TRUCK TIRES THAN ON ANY OTHER KIND

Road Lug, Sure-Grip, All-Weather—T. M.'s The Goodyear Tire & Rubber Company, Akron, Ohio

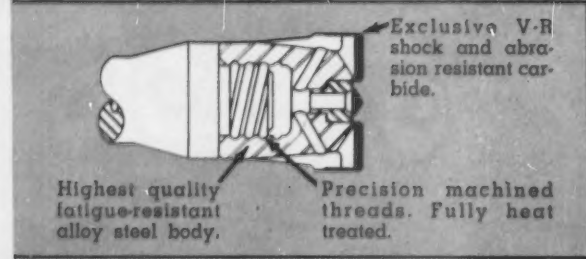
V-R Bits...drill more on any job!


Load is carried where body is strongest. Specifically designed for coupling steels.
Exclusive grade of carbide — manufactured by V-R — wears longer, gives more footage.
Long body distributes load throughout bit body.
Carbide inserts "balance-brazed" to eliminate stresses that cause failure.



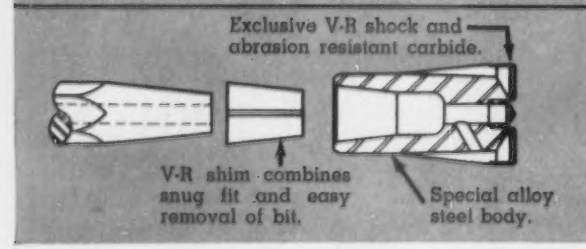
V-R BOTTOMING BITS

. . . an original V-R development—the steel drives against the bottom of the bit body. See diagram. 19 sizes—1¾" through 5". Thread types 200, 400, 600, 700 and 1000.


Exclusive V-R shock and abrasion resistant carbide.
Highest quality fatigue-resistant alloy steel body.
Precision machined threads. Fully heat treated.

V-R SHOULDER BITS

—16 sizes 1⅜" through 4". Thread types F, H, D, K, 113, 115 and 121.


Exclusive V-R shock and abrasion resistant carbide.
V-R shim combines snug fit and easy removal of bit.
Special alloy steel body.

V-R PUSH-ON BITS

—11 sizes 1¼" through 1⅞" for new or reconditioned steels.

Wherever there is rock, V-R Bits are building a reputation for fast, low cost drilling. There are good reasons:

Exclusive Carbide Grades. Since 1930, Vascoloy-Ramet Corporation has been a recognized leader in the manufacture of cemented carbides for severe wear applications. The carbide in V-R Bits is a recent, exclusive development providing exceptional impact and abrasion resistance.

Precision-Set Blanks. V-R carbide inserts are perfectly positioned in the bit body, preventing irregular stresses that shorten bit life.

Heavy-Duty Precision-Ground Bodies. Exclusive design, special non-fatiguing alloy steel, controlled heat treating, accurate threads and precision grinding produce V-R quality products.

Use the bits that are beating them all—V-R Bits!

ASK FOR CATALOG

—call your V-R representative or distributor, or write:

Visit V-R at the Mining Show, Booth 334, Los Angeles, Oct. 1-4

Vascoloy-Ramet Corporation

SUBSIDIARY OF FANSTEEL METALLURGICAL CORPORATION

846 Market St., Waukegan, Ill.

MANUFACTURERS OF CEMENTED CARBIDES, MINING AND CONSTRUCTION BITS, CUTTING TOOLS

M-593

Doing two jobs and keeping ahead of production

THIS Northwest Model 6 Dragline doubles in Brass. It operates 10 hours a day and both strips overburden and loads material.

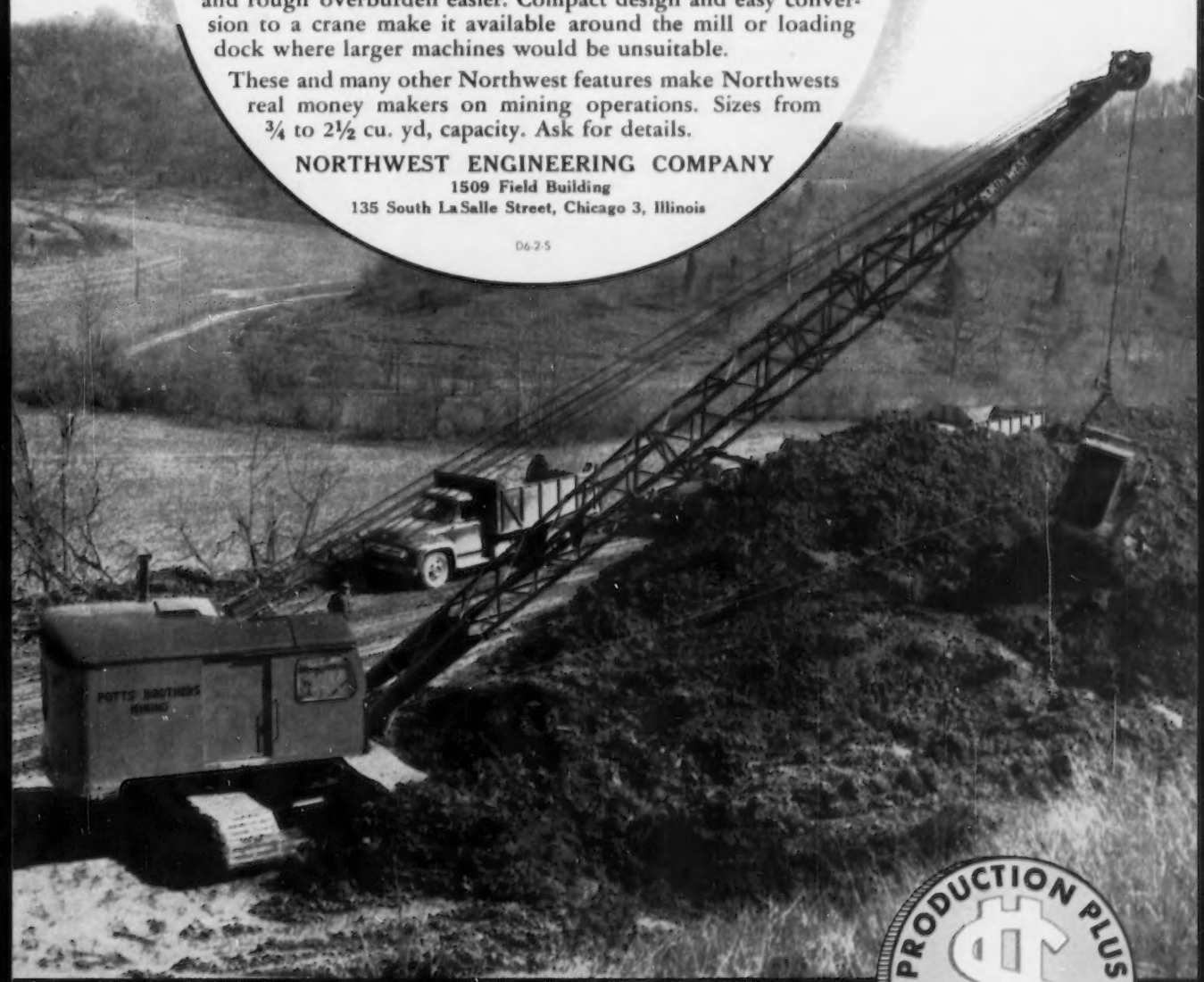
The operation is a phosphate property near Mt. Pleasant, Tenn. The machine is shown loading phosphate for the 5-mile haul to the Victor Chemical Co. smelters at Mt. Pleasant.

Northwests bring the maximum in versatility to smaller operations. Often their advantages make possible speed that outproduces larger machines. Positive traction on *both* crawlers while turning as well as when going straight ahead makes the negotiation of grades and rough overburden easier. Compact design and easy conversion to a crane make it available around the mill or loading dock where larger machines would be unsuitable.

These and many other Northwest features make Northwests real money makers on mining operations. Sizes from ¾ to 2½ cu. yd, capacity. Ask for details.

NORTHWEST ENGINEERING COMPANY
1509 Field Building
135 South LaSalle Street, Chicago 3, Illinois

D6-2-5

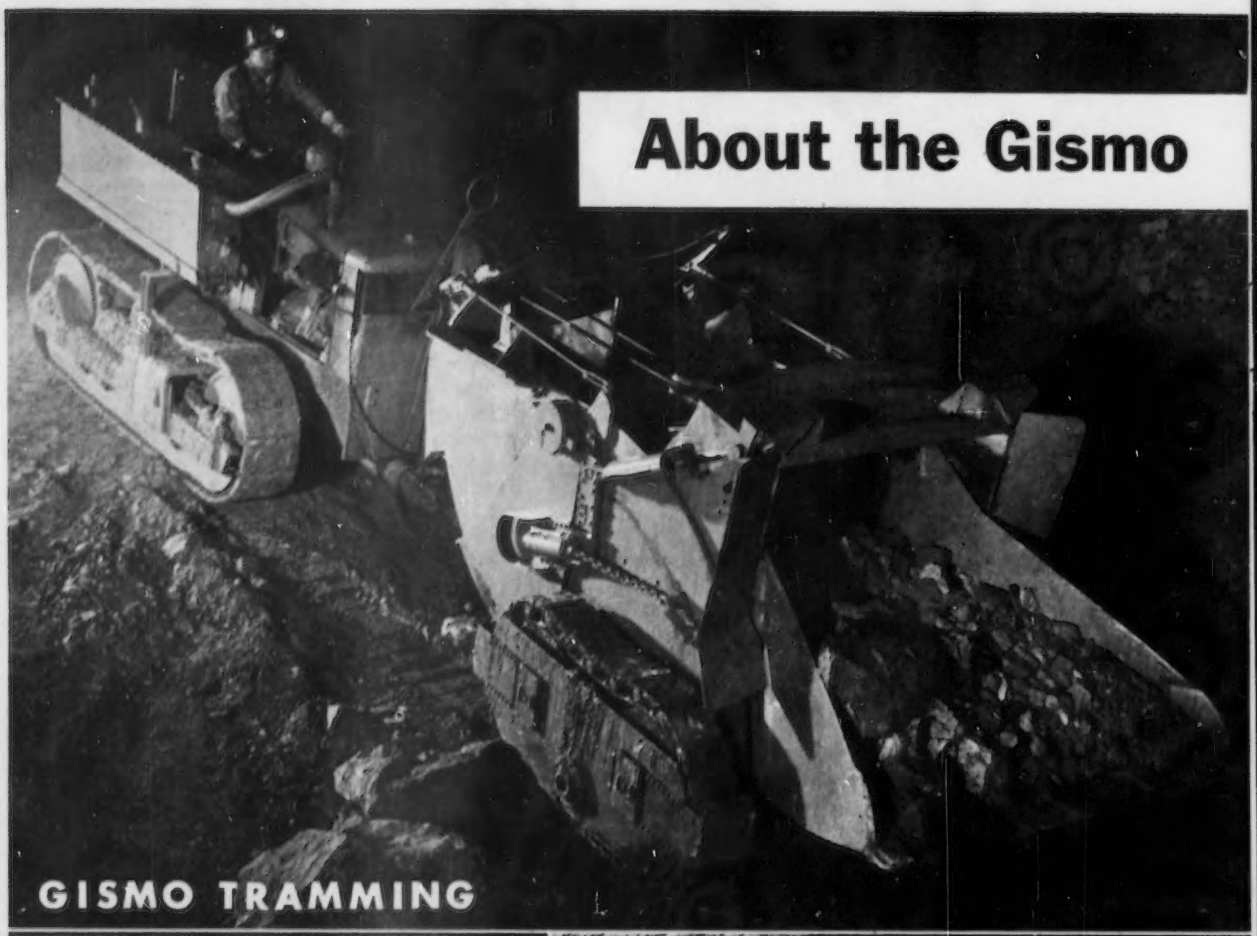


PRODUCTION PLUS · MEANS MONEY ·

NORTHWEST

Convertible for any Mining Material Handling or Excavation Problem

About the Gismo



GISMO TRAMMING

LOADING

DRILLING

DUMPING / IN PRODUCTION

DUMPING / IN S-D CARS IN DEVELOPMENT

equipment– what are the facts?

It is our opinion that mining equipment manufacturers have never before offered the industry such a wide selection of equipment as you will see at this year's Metal Mining Show, Oct. 1-4 at Los Angeles. Unquestionably, tomorrow's production economies and records in profitable mining operations will be the direct result of management's selection of proper equipment . . . equipment around which a simple production method can be devised. And certainly the major prerequisite to maximum simplicity is minimum equipment, minimum labor with maximum production of both. A plan conceived and organized by management around the criterion simplicity becomes increasingly efficient.

We believe the use of the Gismo equipment offers management the logical opportunity of devising a simple production plan. Quite successful systems organized and built around the Gismo have not only resulted in great economy in use of labor and equipment, but have practically eliminated deficiencies of time cycling operation.

Three men with one Gismo Self-Loading Transport, one Gismo equipped as a 4-drill stoping jumbo and a Gismo tractor have produced over a long period of time in excess of 400 tons per shift. These 3 men and 3 pieces of equipment replaced 23 men using 13 separate slusher machines and 5 separate rock drill assemblies.

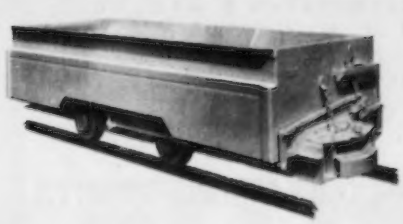
Much less stoping space was required by the Gismo method. The simplicity of the operation together with the greatly reduced manpower made it possible for supervision to practically eliminate the problem of close coordination and time cycling between the various departments of the mine such as drilling, blasting, loading, transportation, hoisting and general services.

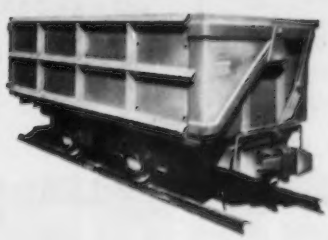
We realize producing such tonnage for so few dollars is a tremendous step forward. The natural reaction is to believe you are reading fantastic figures and statements. Nevertheless, all these facts are very true and they could mean but one thing. With the use of the Gismo equipment you are now free to organize the simple production method you have always strived for but have not been allowed to obtain because equipment permitting simple systems to function has not been available until now.

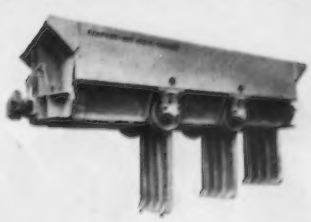
We invite you to visit us at our Exposition Booth 701, outside the Shrine Exposition Hall, and discuss this remarkable equipment with us during the Metal Show. If you are unable to attend, write us now for complete information. Sanford-Day Iron Works, Inc., Knoxville, Tenn., U.S.A.

SANFORD-DAY

"SUPER MARKET FOR MINE CARS"—all types • PRECISION WHEELS
BROWNIE HOISTS, CAR RETARDERS, SPOTTERS • THE NEW GISMO







6042

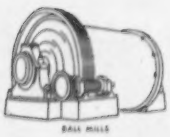
BOOTH 922

MINING SHOW SAN FRANCISCO

the meeting place for mining men

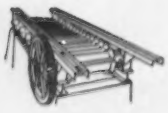
ROTARY KILNS

SECONDARY GYRATORY CRUSHERS



BALL MILLS

PRIMARY GYRATORY CRUSHERS



APRON FEEDERS

For more than half a century, leaders in the mining industry have depended on Traylor-Made machinery for trouble-free operation, profitable production and long-life service. The success these operators have had with Traylor-Made machines is probably best emphasized by the impressive number who return time after time for additional Traylor equipment.

Today, more than ever before, profits depend largely on production economies. We'd like to tell you about the many design improvements and advantages of Traylor Machinery that will help you keep pace with modern methods . . . so don't forget to drop in at booth 922 when in San Francisco. We'll be looking for you.

TRAYLOR ENGINEERING & MFG. CO.
856 MILL ST., ALLENTOWN, PA.
SALES OFFICES: New York · Chicago · San Francisco
CANADIAN MFRS: Canadian Vickers, Ltd., Montreal, P.Q.

A Traylor LEADS TO GREATER PROFITS

Heads Together

At Allis-Chalmers, Integrated Thinking Precedes the Application of Your Integrated Equipment

Allis-Chalmers designs and builds diversified yet completely integrated lines of processing machinery as well as electrical generation, distribution and utilization equipment.

Take a look at the various product departments at Allis-Chalmers and you'll find engineering offices set up for *each* product line. Peek into conference rooms and chances are you will see members of these specialized staffs huddled on application problems . . . exchanging ideas . . . correlating specific know-how and skills.

This proven approach — for which Allis-Chalmers has long been famous — results in truly integrated equipment . . . installations with the various components matched for maximum efficiency at low cost. A-4728

A-C ALLIS-CHALMERS

MORE ABOUT ALLIS-CHALMERS INTEGRATION ON FOLLOWING PAGES.

ALLIS-CHALMERS

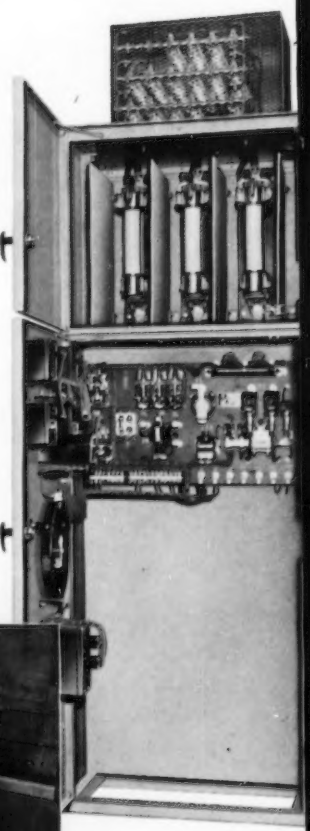
Milwaukee 1, Wisconsin

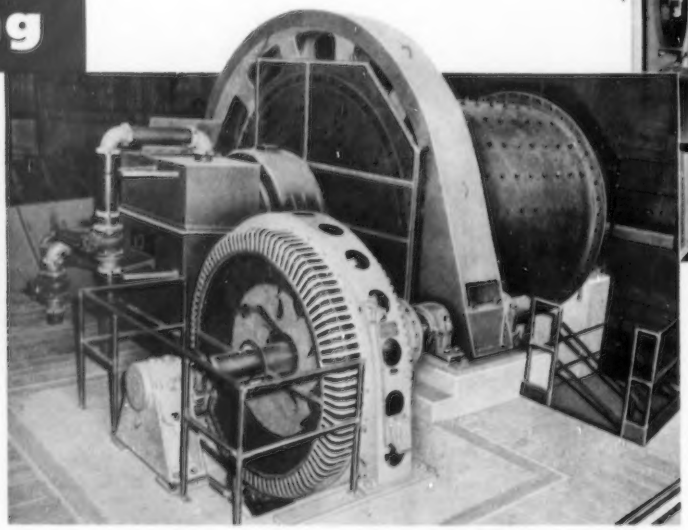
Allis-Chalmers *Teamed Up* for Grinding

BEFORE A RECOMMENDATION IS MADE, requirements and variables are given a careful going over by an Allis-Chalmers team comprised of *grinding*, *motor* and *control* engineers. Characteristics of material, capacity, feed preparation, balance of gradations, torque characteristics, system power factor needs, control requirements are some of the many factors evaluated. Experience has proved that this thorough pre-application investigation and preparation pays off to the purchaser . . . *pays off in maximum capacity of desired product per cubic foot of mill volume.*

A Typical Integrated Grinding Mill Installation

In a recent application, the mill installed was a 10½ by 12-foot Allis-Chalmers diaphragm ball mill. The close diameter-length ratio is an important factor in producing the highest possible capacity per unit of power. Driving the mill is a 900-hp, 4000-volt, 257-rpm, .8 pf Allis-Chalmers synchronous motor. By providing desired power factor correction, this motor reduces power cost. The Allis-Chalmers starter is specially engineered to provide protection under all conditions of grinding operation.





Modern Electrical Distribution Systems Cut Costs

Allis-Chalmers unit substations can be strategically located to bring high voltages near load centers with resultant economy in cable cost, minimum line loss and efficient voltage regulation. Illustrated is Allis-Chalmers switchgear installed underground where it serves motors driving crushers, compressors, shovels and drills.

At Allis-Chalmers, electrical and mechanical engineers combine their skills and knowledge in coordinating the electrical distribution system with processing equipment when working out an efficient product flow.

This integrated effort results in maximum plant efficiency — reduces installation and power costs.

Equipment
Profitable Production

TODAY, WITH SUCH FACTORS as high kw consumption, frequent lengthy outages and costly maintenance disturbing the profit picture, the advantages of integration deserve prime consideration. For example, let's take the problem of cutting cost in a crushing installation.

Special Control Circuit

Drawing on 75 years' experience in building and applying crushers, Allis-Chalmers control *and* crushing engineers developed a control circuit designed to cut costly downtime for the crusher installation shown below. In this circuit, motor overload protection is provided by *two* sets of thermal overload relays. One set operates at slight overload to sound warning. The second set stops the motor when temperature reaches the danger point.

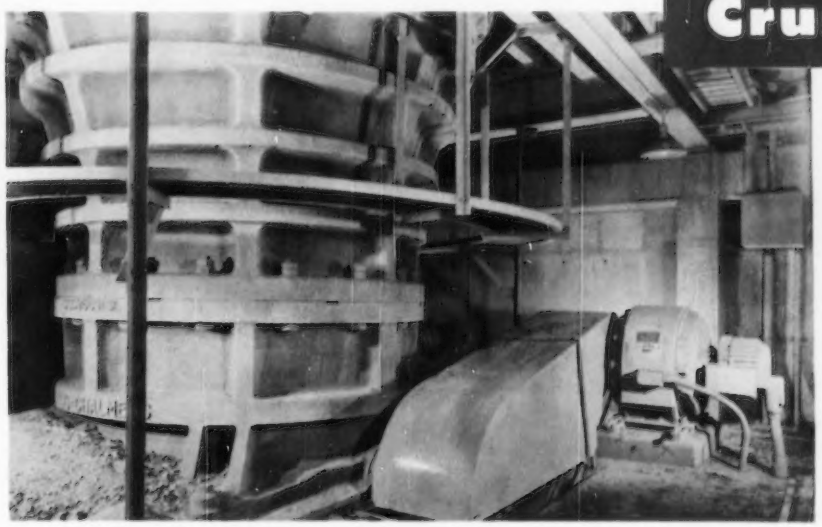
Because of high starting torque and frequent starting under load, an Allis-Chalmers wound-rotor motor is used. In calculating hp requirements, the factors of crushability, ratio of reduction, product size and specific gravity are evaluated.

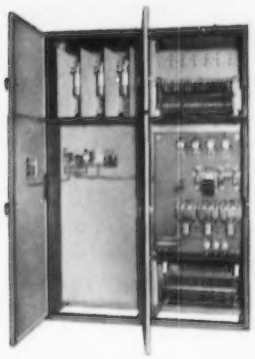
Flexibility in the Crusher

The crusher is the *Superior* gyratory crusher which features hydraulic positioning of mainshaft and mantle. This control facilitates emptying crushing chamber in case of power failure or other emergencies. It also compensates for wear on concaves and mantle and, when required, changes product size instantly. In Allis-Chalmers gyratory crushers, changing eccentricity, speed, or shape of chamber varies capacity and product size. This flexibility permits synchronizing crushing with other operations.

Superior is an Allis-Chalmers trademark.

Crushing





Solids Handling Pump Built to Resist Abrasion

Here is a pump specifically designed to meet the problems of mineral processing. Rugged construction featuring the use of abrasion-resisting materials provides longest possible service life. Because some wear is inevitable in handling mineral solids in suspension, inspection and maintenance have been made easy.

A-C ALLIS-CHALMERS

ALLIS-CHALMERS

Your *Dollar Buys More* when you invest in Allis-Chalmers Integrated Equipment

Because:

- Integrated units or processes evolve from a co-operative engineering effort — all Allis-Chalmers components are matched for top efficiency.
- New as well as *existing equipment* is integrated into a smooth, productive, profitable operation.
- Allis-Chalmers assures undivided responsibility for performance — there is no "buck passing" as frequently prevails when components are purchased from more than one source.
- No other company can provide the background of experience gained through the years of solving thousands of equipment integration problems . . . in research...in testing...in pilot plant operation.
- Modern laboratory facilities, periodic equipment checkups, and fast emergency service from a large stock are always available.

Cost is more than a matter of price tag. Be sure you are getting all the above advantages.

Only from Allis-Chalmers

. . . and it's *FREE!*

Nowhere else can you get this valuable book at any price!

The Third Theory of Comminution, or *work index* method, is a compilation of factual data on crushing and grinding obtained in over 35 years of field and laboratory testing. Correlating this information made it possible to establish a consistent common factor called the *work index*. Knowing the *work index*, you need only apply a given equation to determine required power input. The calculated power input enables you to select the proper crusher or mill for your job.

This practical formula, together with more than 1200 tabulated work indexes, is now available in a 72-page bulletin (07R7995). For your cost-free copy, see your Allis-Chalmers representative or write Allis-Chalmers, Industrial Equipment Division, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS

INDUSTRIAL EQUIPMENT DIVISION

ALLIS-CHALMERS Milwaukee 1, Wisconsin

Send me the following bulletins:

- 25C6166D, a mining industries catalog
- 07R7995, Third Theory of Comminution

I would also like bulletins on:

_____

*Explanation of Process or Problem*_____

_____
(Type of Equipment)

Name _____ Title _____

Company _____ Address _____

City _____ Zone _____ State _____ A-4728

WRITE FOR LITERATURE

Bulletin 25C6166D covers all equipment manufactured by Allis-Chalmers for the mining industries. Individual bulletins covering specific equipment lines are also available.

VACSEAL PUMPS

are star performers

In every instance tailored to fit the job, VACSEAL Pumps are serving in a wide range of industry . . . handling acids, salts, chemicals, abrasives and corrosives.

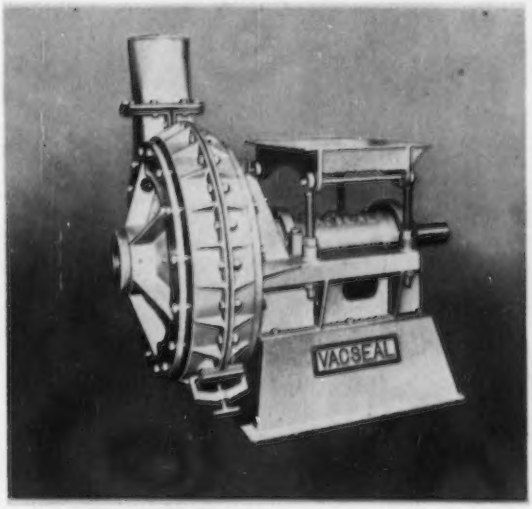
VACSEAL specifications include replaceable or fixed liners and other parts of natural or special rubber compounds, hard iron or special alloy, acid-proof or standard—all engineered for your requirements. This construction provides complete adaptability to liquids and solids pumping operations. Sizes: 1½" to 8"

Be sure to visit our display at the Mining Show. See at first hand such forward-looking engineering developments as:

1½" x 2" VACSEAL, acid-proof, Neoprene liners; 2" x 2½" standard VACSEAL with drip-proof motor; 3" x 4" VACSEAL, acid-proof, stainless steel impellers; 4" x 6" VACSEAL, acid-proof, with replaceable liners; 6" x 8" standard VACSEAL with Neoprene fixed liners; 8" x 10" VACSEAL, acid-proof, with replaceable liners and models of the Galigher Acid-proof Sump Pump.

Other features of the Galigher display are rubber-lined and rubber-covered metallurgical products and new plastic fabrications.

See it all October 1 to 4!

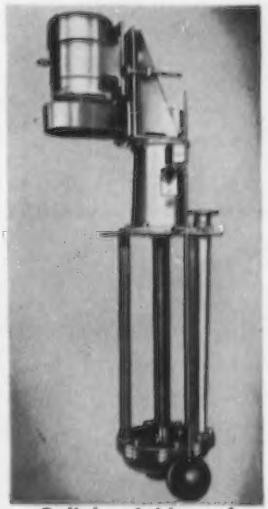


VACSEAL Pump
10-3600 gpm

For complete information write or see us at the

1956 MINING SHOW

Booth 301
Oct. 1-4 · Los Angeles



Galigher Acid-proof Sump Pump 10-250 gpm

Leaders in Experience and Service

THE GALIGHER CO.

METALLURGICAL DIVISION · ENGINEERING SERVICE

CONSULTATION • ORE TESTING • PLANT DESIGN

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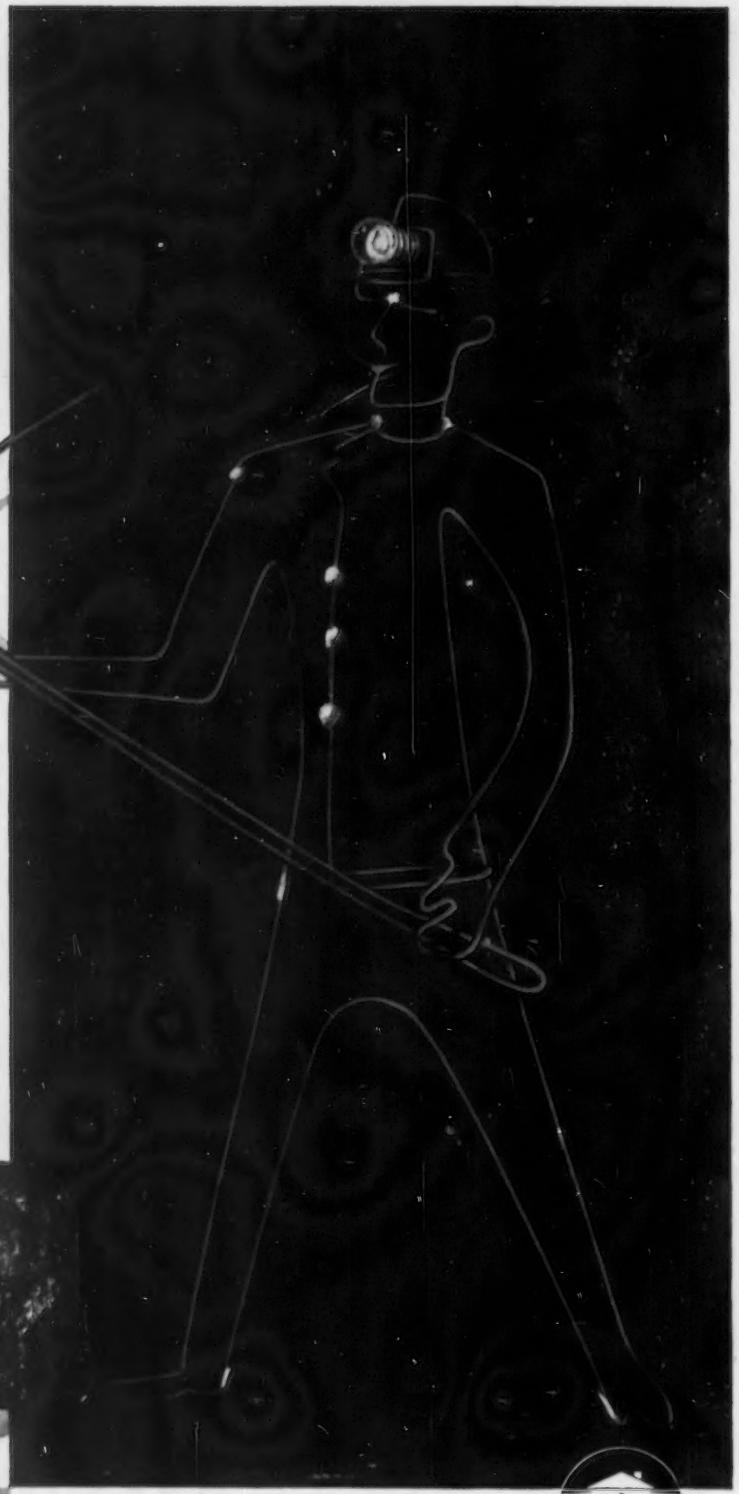
GALIGHER PRODUCTS: AGITAIR® Flotation Machine, VACSEAL Pump, Geary-Jennings Sampler, Acid-proof Sump Pump, Geary Reagent Feeder, GAL-CLONES, Laboratory AGITAIR® Flotation Machine, Laboratory Pressure Filter, Laboratory Ball Mill, Rubber Lined and Covered Products, Plastic Fabrication.

Wire Sculpture By Henry Szaforz



The Right Pick is important. That applies to choice of trailing cords and cables, too. Be guided by the fact that veteran mine-men prefer TIREX. This expertly engineered cable, newly improved for greater flexibility, has cured-in-lead Neoprene Armor that resists abrasion, oil, heat and water . . . gives maximum wear.

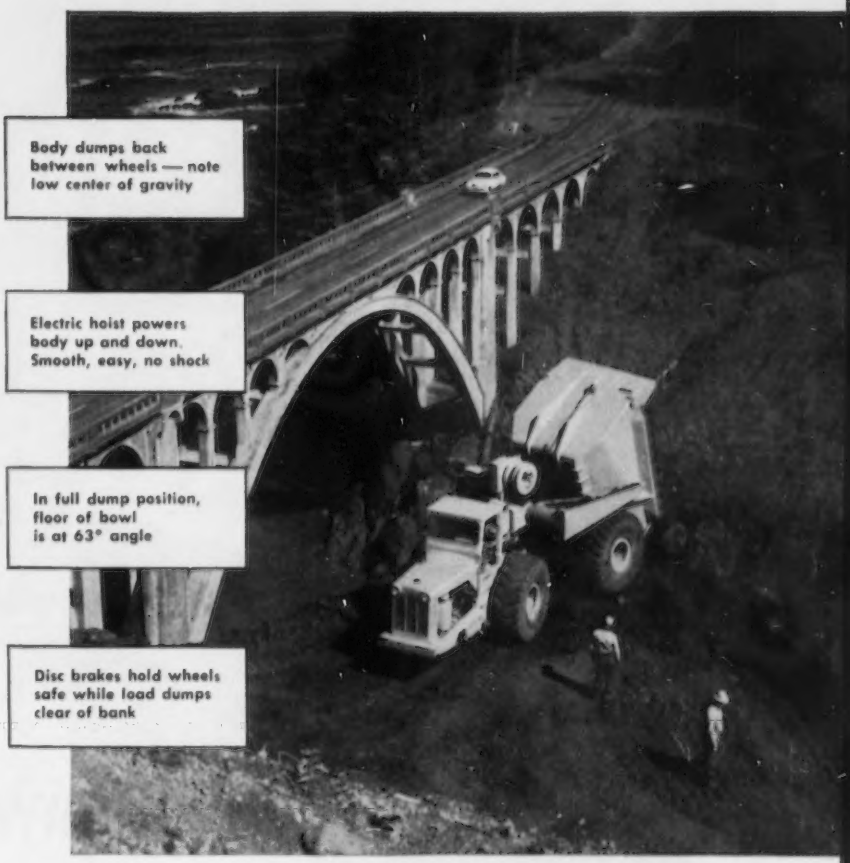
SIMPLEX WIRE & CABLE CO.,
79 Sidney Street,
Cambridge 39, Mass.

Visit us at BOOTH 1048
Mining Congress Show

LIVE BETTER ELECTRICALLY

Simplex–TIREX

Dumps anywhere— over-the-edge or on-the-move

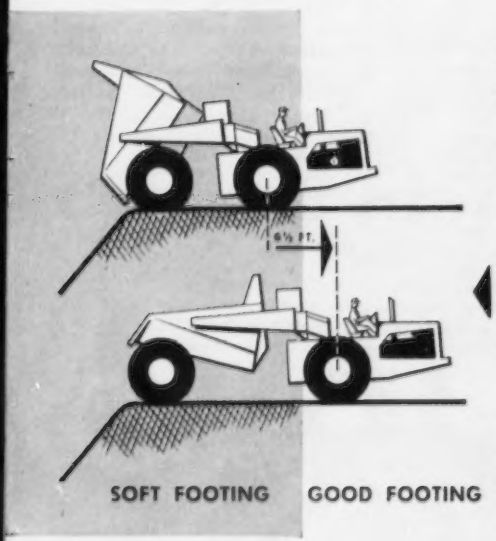

Body dumps back between wheels — note low center of gravity
Electric hoist powers body up and down. Smooth, easy, no shock
In full dump position, floor of bowl is at 63° angle
Disc brakes hold wheels safe while load dumps clear of bank

Tournapull Rear-Dumps can go anywhere—on or off-the-highway — to place loads exactly wherever you want them.

To dump over the edge of bank, all you do is back close to dump point. Rig's big single tires and power steer take you over rough footing and soft fills where many trucks can't go. Dump is made by flicking electric switch on control panel. This instantly activates hoist motor. Body "rocks" back easily over rear axle. You have power up and power down. Movement is under positive cable control at all times, can be stopped at any angle. At full dump angle, bowl lip is at ground level *behind* rear wheels. This position prevents material from rolling forward under wheels. It also provides free dump over edge of bank and greatly reduces need for dozer cleanup.

Safe at all times

In dumping, Tournapull Rear-Dumps are safer than any truck. Front-wheel-drive keeps power and traction on solid footing well ahead of rear wheels. Because body does not need to clear frame, springs, axle, or differential, its center of gravity stays low, even during dump. Oversize multi-disc air brakes — *with more braking surface on one wheel than comparable-size trucks have on all four* — prevent creeping or rolling.



Separate braking of front and rear wheels can be used with action of hoist to help front wheels pull away from edge of soft dump. In case of trouble, rear brakes are set, front brakes released. When bowl is lowered from normal dumping position, free-rolling prime-mover wheels are pushed forward. On the "C" size Rear-Dump, they move 6½ ft. — usually enough to find good footing. If front drive wheels do not reach good footing after bowl is lowered, same "leap-frog" process can be repeated. Simply pull rear wheels forward by setting front brakes and raising bowl, then set rear brakes and push front wheels ahead by lowering bowl.

Accurate spreads while moving

Tournapull Rear-Dumps can also spread on the run. Bowl can be safely raised and lowered at normal haul speed. Operator simply positions bowl for desired flow of material and continues to drive.

There's a Tournapull Rear-Dump size to fit your needs

(Now available with optional tailgate)

"D"	"C"	"B"
11 TONS	22 TONS	35 TONS
138 HP	208 HP	293 HP

Prime-movers for these Rear-Dumps also power scrapers, bottom-dumps, flatbeds, and cranes.

Tournapull—Trademark Reg. U.S. Pat. Off. R-778-G-bw

LeTourneau-WESTINGHOUSE Company, PEORIA, ILLINOIS

A Subsidiary of Westinghouse Air Brake Company

ARBA See you at the ROAD SHOW • Chicago • January 28-February 2, 1957

Joy 60-BH Drill in operation in a large Southwest copper mine.

Here's the drill you need for LARGER, LOWER-COST BLASTHOLES

the JOY 60-BH Super Heavyweight Champion

For high-production open pit mining of copper, as illustrated above, large-diameter blastholes are a *must!* The way to drill those large-diameter holes economically —either in copper ore, or in any other open-pit mining or overburden removal job—is with the Joy 60-BH Super Heavyweight Champion. Here's why: because this Joy rotary drill excels in all three of the features which determine bit penetration:

ROTATION—Infinite variation of bit speeds, accurately controlled bit speeds, more power on bit rotation, and constant indication of bit speed and pressure by gauges.

BIT WEIGHT—The Joy hydraulic feed, using two 5-foot hydraulic cylinders, is the most efficient and dependable method of applying bit pressure. It is more accurately controlled and less hazardous than other methods.

CUTTINGS REMOVAL—Only Joy uses a heavy-duty, industrial-type, water-cooled air compressor to insure more dependable air supply required for efficient rotary-air blast drilling.

Other features include a self-aligning hydraulic automatic chuck, hydraulically raised and lowered derrick, and rod handling device.

The 60-BH, capable of drilling 9" to 12" diameter holes in even the hardest rock formations, is the largest in the outstanding line of Joy Champion "rotary-air blast" drills. Smaller models are the 58-BH Heavyweight for 7⅞" diameter holes, and the 56-BH Middleweight for 6¼" diameter holes. Let us quote on *your* requirements. **Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.** In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*

Write for FREE Bulletin 35-4

Consult a Joy Engineer

For AIR COMPRESSORS, ROCK DRILLS, CORE DRILLS, HOISTS and SLUSHERS, MINE FANS and BLOWERS

WSW MS606-35

JOY

WORLD'S LARGEST BUILDER OF CORE DRILLS, ROTARY BLAST HOLE DRILLS AND MOTORIZED DRILL RIGS

Northern Rhodesia

Saves year in completing road to isolated copper mines

Deep in Northern Rhodesia's forest wilderness, near the Belgian Congo border, lies what geologists call the most important single copper-producing area in the world. From a 40 x 140 mile belt comes 250,000 to 300,000 tons of metal annually — 10% of the world's supply. Though mining has been an important industry here since 1927, roads are still inadequate. To bring in necessary supplies, or to carry out the rich copper sulphide ores is expensive, difficult, and time-consuming.

Modern machines make the difference

Recently, the Government of Northern Rhodesia moved to change this situation. A 95-mile (153-kilometer), all-weather road was planned. Engineers estimated 30 months would complete the project.

The contractors, Cramond Earth Movers Rhodesia Ltd., told the government they could better that schedule. In order to do it, they brought a fleet of 7 fast-operating, rubber-tired LeTourneau-Westinghouse machines to the job site at Choma. When photos were taken, these units were building 10 miles of road per month — instead of the scheduled 3 to 4 miles. Earthmoving was 60% ahead of schedule. Even allowing for lower output during the four-month rainy season, contractors and government officials believed that the 95-mile all-weather route would be finished within 18 months instead of the 30 in the original estimate.

Handle variety of work, faster

Two Tournatractors, three Model C and two Model D Tournapulls were working 72 hours a week, moving the 500,000 cubic yards necessary to the job, at the time the work site was visited. After completing the largest cuts and fills, Tournapulls spread and compacted a laterite surface, finishing it to within one inch of grade line. Says Edward Austin, one of the officials of the company, "Accurate control of D Tournapulls has, on this job, cut grader work to an absolute minimum."

Moving subsoil for formation work, D Tournapulls have averaged a 2400-ft. load-haul-spread-and-return cycle every 6.3 minutes. Each unit has delivered 9 loads of approximately 5½ pay yards each per hour.

Performance earns repeat orders

Cramond Earth Movers bought their first LeTourneau-Westinghouse machine, a second-hand Tournatractor, in 1950. Since then, they have purchased 6 more Tournatractors and Tournapulls. As a fleet, the 7 units have worked a total of 43,000 hours. Tires shown, each more than 4000 hours old, are still in usable condition. Mr. Austin reports, "Our Tournapull fleet has been increased three times, indicating our satisfaction. Downtime has been very low and production high."

Drive job-to-job

Another big advantage of rubber-tired units is their ability to drive job-to-job under their own power. These machines have traveled all over Central Africa to level marshalling yards and industrial sites, and to build sports fields and earth dams. Their big, low-pressure tires roll over paved highways, across country, or over railroad tracks without damage to surface or tires.

Let us help you

If you have similar projects, it would pay you to find out how much LeTourneau-Westinghouse machines can save YOU in time and money. Call or write us for more information.

Tournatractor, Tournapull—Trademark Reg. U.S. Pat. Off. TDP-683-M-b

Before start of grading, D Tournapulls cleared away a number of ant hills like these. Each hill measured as much as 400 cubic yards.

LeTourneau-WESTINGHOUSE Company, PEORIA, ILLINOIS

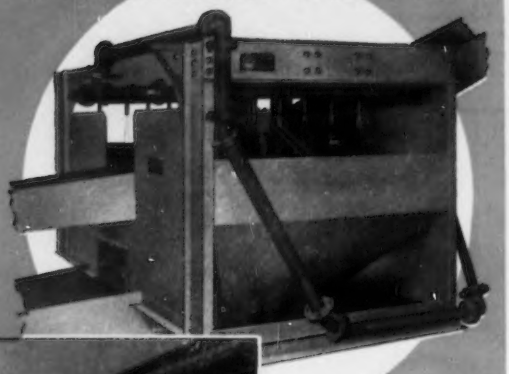
A Subsidiary of Westinghouse Air Brake Company

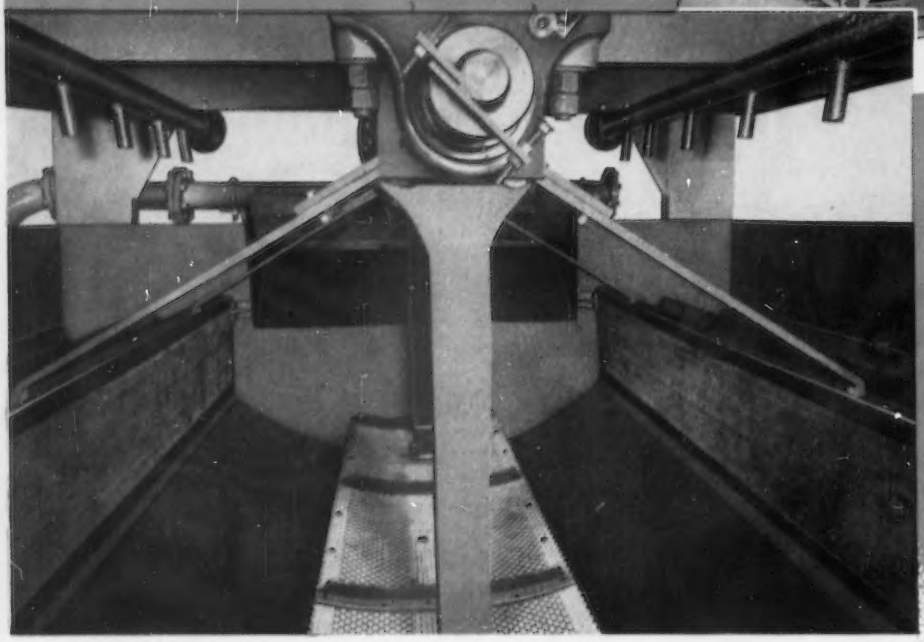
ARBA See you at the ROAD SHOW • Chicago • January 28-February 2, 1957

Now...BETTER HM SEPARATION

with OCC Vessel

because of its large productive pool area





Left, view of the interior of the OCC Heavy Media Vessel, illustrating its large pool area; view is from discharge end of vessel. Above, exterior view: float and sink discharges on left and feed chute on right.

U. S. and Foreign Patents Pending

Simplicity of OCC Vessel Introduces Broad Operating Economies

Since the introduction of the Heavy Media process, the development of a separator whose simplicity would match that of the process has been an aim. This has been achieved through the design of the OCC Vessel illustrated above. The rake suspended in the center oscillates the width of the vessel. In so doing, it maintains in productive use practically the entire volume of the vessel, in contrast to other separators employing only a fraction of same. The result is improved metallurgy and increased economy.

The remarkable simplicity of the vessel is pointed up by the fact that the rake, the only moving part in the vessel, performs not only the function of removing the sink but also that of keeping the medium in suspension. Let us send you details of how the OCC vessel can increase your operating profits, and reduce maintenance costs in an HMS plant.

See Working Model at Booth 401 Los Angeles Mining Show

THE ORE & CHEMICAL CORPORATION

Division: Mining & Milling Machinery • 80 BROAD ST., NEW YORK 4, N. Y.

Moving fast, this 550 Adams grader keeps pit floor clean, saving wear on fleets' tires and treads. Permits driving equipment by shortest routes, improves drainage.

This high-speed modern grader keeps haul-roads in first-class condition to speed movement of production haulers, reduce wear on tires and machines.

Cut mining costs thru better clean-up

There are only two ways to increase your mining profits without a rise in the price of ore. You must increase production, or lower costs...or both.

You may think of your grader simply as a maintenance tool. But in the hands of a good operator, a versatile, modern high-speed grader increases mining production and cuts operating costs. Check these 9 ways increased grader capacity can increase your profits.

Occasional spill over sides of heaped trucks ...around hoppers, grizzlies, conveyors, and trestles...can litter concentrating plant area, slow traffic, damage tires. This Adams grader keeps this area clean by daily clean-up.

1. ***Regular and more frequent maintenance of haul roads*** — smooth roads speed hauling, save tire-wear, cut mechanical maintenance, improve safety.

2. ***Quick clean-up after blast***—grader provides a fast, inexpensive way to move scattered fragments back against toe, thus protecting men, machinery, and tires working around pit, speeding up all pit operations.

3. ***Clean pit floors*** — regular routine of maintaining wide traffic ways that make all areas of pit quickly accessible pays off. Equipment can travel to any assignment by shortest route. Smooth access saves wear on tires and crawlers, improves drainage, prevent dirt and refuse from weathering into levels of ore below floor.

4. ***Maintain good housekeeping around plant***—you need ample grader capacity to keep roads, runways, working areas around plant neat, clean, and workable at all times. Level or remove the occasional spill left by heaped trucks...from around hoppers, grizzlies, conveyors, trestles. Clean plant area speeds all mobile equipment operation around plant, reduces dust, improves safety.

5. ***Keep stockpile toes pushed in*** — weather and loading operations result in spread of toes around stockpile. This limits working space, wastes stored material. Also, working thinly-spread toes means inferior ore grades, increases loading cost. Regular grader service helps prevent this waste.

6. ***Keep dumps smoothly spread and level*** — regular grader service can spread dumped material clear over edge. Offset blade reaches far beyond leaning front wheels which hold against side thrust. A smooth, level, dry dump speeds hauling and dumping, cuts equipment costs. Grader can smooth haul road coming and going.

7. ***Clean ore benches of washed-down dirt*** — every rain washes dirt into upper benches, lowers ore grade. Prompt grader service halts "wash", provides planned drainage, piles washed-in material for easy removal by scraper or truck.

8. ***Assist exploration teams*** — a modern grader can build a well-graded and drained roadway in a matter of hours, speeds exploration work by maintaining good haul roads.

9. ***Keeps drainage open*** — in a few hours work per week, a modern grader will keep ditches clean, pit dry.

Inventory capacity of your present graders

It will pay you to inventory the work capacity of your present graders. If they are more than a few years old, you will probably find a substantial saving in replacement with the faster, more powerful, big capacity graders currently on the market. We will be glad to assist by furnishing specifications and comparative statistics on our line of modern Adams graders.

Reprints available on request.

AG-24-M-b

LeTourneau-**WESTINGHOUSE** Company, PEORIA, ILLINOIS

A Subsidiary of Westinghouse Air Brake Company

ARBA See you at the ROAD SHOW • Chicago • January 28-February 2, 1957

LOOKING FOR THE LOWEST-COST TRUCK?

Take a tip from the men who buy trucks every year!

Big fleets buy more Fords

"Our 27 Fords average 5½ miles to the gallon," say cement haulers of Material Transportation Company, Harlington, Texas. "Oil economy is good, too. Our F-800 and F-900 BIG JOBS average 125,000 miles before we drop the pan. Fords are the most economical and satisfactory trucks we've ever used."

The big fleets keep complete cost records. They know which trucks cost less to buy and run. And official R. L. Polk registration figures PROVE FORD IS THE FAVORITE!

Take a look at these pages. These leading companies are just 4 out of thousands that are finding Ford trucks cost less to buy, less to run—*and* are "tops" for all-round economy.

The "men who buy trucks every year" must take everything into consideration . . . Short Stroke engine design for low oil and gas consumption . . . Ford's stronger chassis for longer life (insurance actuaries prove Ford Trucks last longer) . . . and Ford's higher resale value. So—from Pickups to 65,000-lb. GCW BIG JOBS, the big fleets are going Ford. You'll agree *Ford Trucks cost less*—after discussing your needs with your Ford Dealer.

SERVING THE MINING INDUSTRY

"Our 300 Fords cost less to run," says Johnson, Drake and Piper Inc. of N. Y. City, world-wide contractor and owner of F-800 BIG JOBS. "We've tried all makes but our records show that, when all factors are considered, *Ford Trucks cost less.* Low running costs. Low purchase price. High trade-in value."

than any other make!

"Our 102 Fords last longer," says David L. Brown, Tennessee contractor and owner of Ford T-800 BIG JOBS. "In our kind of work, we need a truck that can take a real beating and keep on going. We have a Ford that's been running for 5½ years without a motor job—and it's still rarin' to go!"

"Our 30 Fords are easiest handling," says Elmer C. Breuer, Cleveland steel hauler. "Maneuvering our Ford F-900's in tight spots is timesaving and easy. And with that Power Steering our drivers finish fresh after a tough day's work. We're staying with Ford because they give us fast, dependable service."

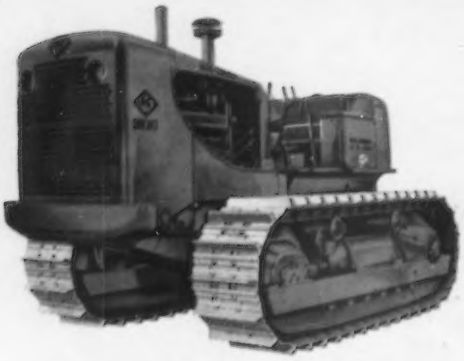
FORD TRUCKS COST LESS—LAST LONGER

Using latest license registration data on 10,502,351 trucks, life insurance experts prove Ford Trucks last Longer.

MODERN ALLIS-CHALMERS EQUIPMENT

SERVING THE MINING INDUSTRY

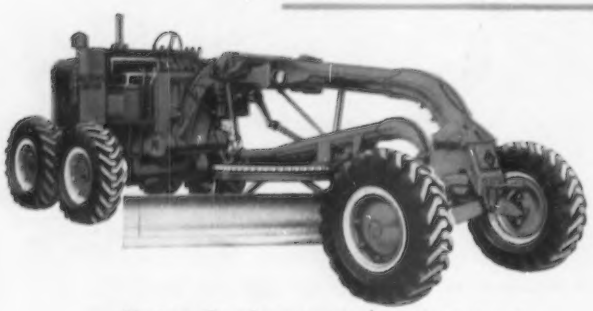
Surface Mining



Crawler Tractors

HD-21 (Largest of 4 Allis-Chalmers models)
Torque Converter Drive
204 net engine hp, 44,000 lb

Crawler tractors with matched bulldozers handle stripping, stockpiling and many other jobs. Allis-Chalmers exclusive Box-A Main Frame does not transmit strain from dozer to engine, clutch or transmission — just one of many proven features that give long life.



Motor Graders (model Forty Five illustrated)

Three diesel-powered models up to 23,800 lb
One gasoline engine model
50 hp, 8,800 lb

Motor graders combine power and minute precision as they level pit bottoms or prepare dragline sites. Adjustable seat, power steering and pilot house visibility of this Model Forty Five help the operator work better with less effort.

Motor Scrapers

TS-260 (illustrated) 14-cu-yd capacity, heaped
TS-360 20-yd capacity, heaped
Also 5 pull-type scrapers
Capacities from 2 to 18 cu yd

For big-volume stripping, you can count on Allis-Chalmers motor scrapers to load fast, travel fast and dump clean. Special, high-apron lift prevents material from jamming. Even when loaded from overhead, anything that can be put into the bowl can be easily ejected.

Motor Wagons (TR-260 illustrated)

Rear- and bottom-dump models
Bodies interchangeable with motor scraper bodies

Large top area of this Allis-Chalmers bottom-dump motor wagon permits fast loading with less spillage. Positive hydraulic steering lets operator spot wagon quickly without tiring wheel fight. Hydraulically operated doors allow full or controlled dumping.

MODERN ALLIS-CHALMERS EQUIPMENT

Hauling and Haul Roads

Allis-Chalmers crawler tractors and pull-type scrapers are an ideal team for tough cut and fill work and short-haul stripping. Whether pushing or pulling, Allis-Chalmers torque converter drive sets new standards of tractor-scraper performance.

The low-cost Model D is a real economy leader on haul road maintenance jobs. It has tandem drive ROLL-AWAY moldboard, tubular frame and other big-grader design and performance features, yet it costs only one-third that of large machines.

The TS-260 motor scraper develops 18 hp per cu yd struck capacity. This gives you high travel speed when it counts most — traveling with a payload or working on adverse grades. Positive, controlled hydraulic steering permits fast, safe travel.

Wheel base on the TR-260 rear-dump motor wagon does not change while dumping. Thus, operator can lock air brakes on all four wheels while dumping over steep drops — an important safety advantage. Smooth interior, plus high, 70° tilt assures fast, clean dumping.

Underground Mining

The 1½-yd HD-6G excavates ore, transports it to the surface, or loads shuttle cars underground. Tractor Shovels are available for all four Allis-Chalmers tractors with buckets up to 4 cu yd. All have electric starting on diesel fuel for greater safety.

SEE US AT THE

MINING SHOW

LOS ANGELES, OCT. 1 to 4

BOOTH Nos. 737-733-729-725-836-832-828-824

Keeping Step with Stepped-Up Demands

In the past 15 or 20 years, the mining industry has kept production costs down in spite of rising labor and material costs. To do it, mine operators have pioneered new methods that put constantly increasing demands on machinery.

Through the years, Allis-Chalmers has kept pace with these conditions by gearing its equipment development to the mine operator's needs. Here is just a small sample of this modern equipment at work. For further information write Allis-Chalmers — producer of the most complete line of major mining tools.

ALLIS-CHALMERS, CONSTRUCTION MACHINERY DIVISION
MILWAUKEE 1, WISCONSIN

ALLIS-CHALMERS

ROLL-AWAY is an Allis-Chalmers trademark.

INTRODUCING *the latest addition to the famous line of Timken carbide insert and multi-use bits:*

New Timken® tapered

It's removable—

Lets you get full life out of drill steel —lowers reconditioning costs

It remains secure—

Precision tapered socket gives a secure union between bit and steel

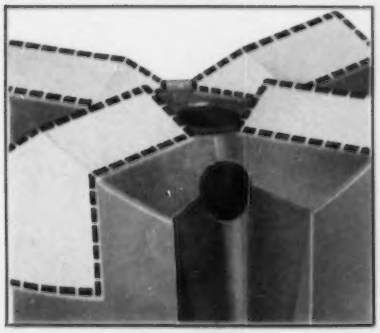
For the first time in the United States, the Timken Company introduces a rock bit for air-leg drills and light stoping with all the many advantages of removable bits, all the advantages of carbide insert bits, and specially designed frontal features to cut your drilling costs per foot of hole. Plus a consistently uniform *tapered socket* that assures a secure union between bit and drill steel, reduces breakage, and detaches quickly and easily!

With the new Timken® removable tapered socket bit you'll get full life from your drill steel, cut your reconditioning costs, and you can change bits faster. And like other Timken carbide insert bits, the Timken tapered bit will hold its gauge longer, drill faster, cut your bit costs on really tough drilling jobs. Special analysis carbides give the Timken tapered bit superior wear-resistance, with added shock-resistance. Adds life to the bit. Other new mechanical features—specifically made to cut drilling costs on air-leg drills and light stoping—include five specially positioned front blowing and washing holes, and new extra clearance between wings for speedier chip removal.

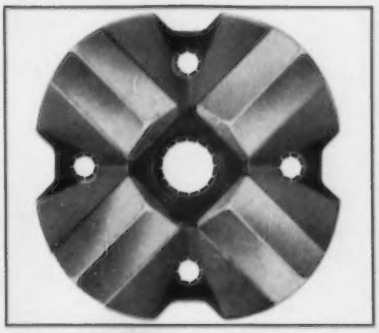
This new Timken tapered bit can be reconditioned many times. And the body is made of special analysis Timken electric furnace fine alloy steel—with the finest physical properties obtainable in a rock bit today. For more details, get your free Timken tapered bit brochure! Write to: The Timken Roller Bearing Company, Canton 6, Ohio. Cable address: "TIMROSCO".

See us at the 1956 MINING SHOW Oct. 1-4, Shrine Exposition Hall, Los Angeles, Cal., BOOTH 635.

socket bit FOR AIR-LEG DRILLS AND LIGHT STOPING



LONGER BIT LIFE FROM WEAR-RESISTANT CARBIDES: Special analysis long-life carbide inserts give the 4-point "cross" cutting face superior wear-resistance, with added shock resistance. This new cutting edge adds service life to your bit, *lowers your cost per foot-of-hole.*



JET ACTION FROM 5 FRONT HOLES SPEEDS DRILLING: Positioned to direct water against face with more velocity, wash away chips faster. Larger center hole, with plug dropped deeper for freer cutting action, less drag on bit. New frontal design adds life to bit, *cuts your cost per foot-of-hole.*

FASTER CHIP REMOVAL WITH DEEPER, WIDER CLEARANCE: Extra deep, wide clearance, works in conjunction with five front holes to speedily remove chips from the cutting face. Speeds drilling, makes cutting more efficient, adds life to bit, *helps to lower your cost per foot-of-hole.*

Improved Timken Threaded Carbide Bit

for all your other tough drilling jobs

An improved version of the famous Timken threaded carbide bit! Offering deeper, wider clearance between wings—and special analysis carbide inserts for superior wear-resistance—this new Timken threaded bit offers two additional features: new, *deeper undercut* under the heel, and a new, improved thread contact! The deeper undercut adds life to your bit by improving extra clearance for washed-back chips and abrading particles—and reduces drag on the bit during drilling. A new redesigned heavier wing also contributes to faster drilling and longer bit life. By adding service life to your bit these newly designed features *lower your drilling cost per foot-of-hole.* For more details, write for your free copy of our newest brochure on Timken Threaded Removable Rock Bits.

TIMKEN REMOVABLE ROCK BITS

TRADE-MARK REG. IN U. S. PAT. OFF.

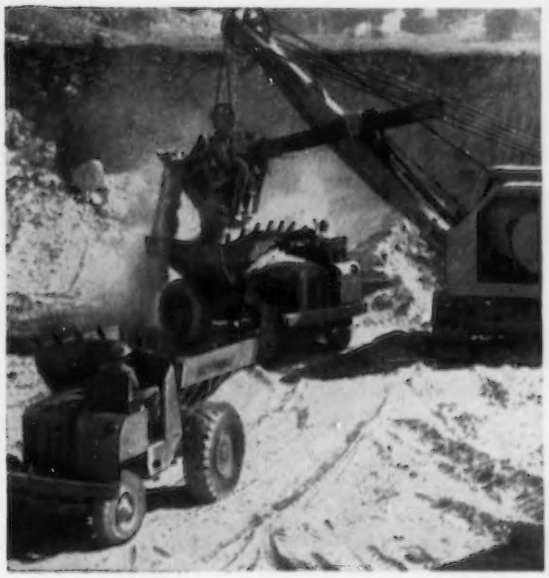
Your best bet for the best bit for every job . . . threaded carbide insert, multi-use tapered carbide insert

Shuttles underground *without turning*

There's no room to turn in this mine tunnel — and no need to turn. Koehring Dumptor drives up to the tractor-shovel, body forward, gets its load — and then shuttles back out of the tunnel at the same speed as it entered. Dumptor operates with equal ease in either direction. It gets this no-turn operating advantage through a constant-mesh transmission that gives the same 3-speed travel forward and reverse. Dumptor no-turn hauling has gained wide acceptance in both underground and strip mining, as shown on these pages. It solves problems of operating along overhead trestles, on open-pit ledges, narrow haul roads — is especially practical for stockpiling. There's an important production advantage, too. Every turn eliminated cuts 15 seconds off cycle time. This adds up to a substantial increase in yards or tons hauled per hour. For example — by saving only 2 turns on a round trip, time studies prove that Dumptor often increases hourly yardage output more than 10% on an average 1000-foot haul. Better have your Koehring distributor show you what Dumptor no-turn hauling can mean on your mine, quarry or stockpile operations. He has some facts and figures that will interest you. Call today.

Elevated haul-way — On extensive stockpile operation, Koehring 6-yard Dumptor shuttles along overhead trestle. It travels from mine headshaft to edge of stockpile, dumps, and returns for next load — never turns. This trackless method replaced lorry cars at several mines. Some Dumptor owners set up access ramps, instead of using trestle systems.

Dumps in one second — Dumping off end of hillside trestle, operator drives up to hopper, trips the body-release lever, and *gravity* dumps the 6-yard load instantly. One second later, Dumptor is on its way back. There is no 15 to 25-second wait for slow-acting body hoists. Koehring *gravity-dump* works every time — never balks, and never wears out.



Big production team — Working with Koehring 1½-yard shovel, Koehring Dumptors are loaded with body forward, ready to travel and dump without turning. These heavy-duty haulers have better than 6 h.p. for every ton of loaded weight — accelerate fast, pull through soft ground, up grades and ramps with less shifting — climb 24% grades fully loaded.

Stockpile specialist — Dumptor puts stockpiling on a fast shuttle-haul basis — eliminates turning at the loader and on top of the pile. Notice how instant dumping action kicks the load out over edge of pile — saves a lot of dozer clean-up. Free-swinging kick-out pan breaks load suction in wet materials, bolts down to floor when handling rock.

KOEHRING COMPANY, Milwaukee 16, Wis. Subsidiaries PARSONS KWIK-MIX • JOHNSON

how to get the most out of HOLLOW DRILL RODS

The present trend in mining is toward smaller drill holes which require the use of smaller bits and, consequently, smaller hollow drill rod sizes. And that's increased the use of *alloy* steels such as Crucible CA DOUBLE DIAMOND and 4E Hollow Drill Rods.

These new alloy rods have proved themselves on many jobs by lengthening rod life, cutting drilling costs. But they are not unmixed blessings, for they will give a good account of themselves only if they are handled properly. Hammer and tongs blacksmithing isn't enough. Alloy rods demand greater care in forging, upsetting and heat-treating.

Should You Use Carbon or Alloy Rods?

There's no one answer to that question, unless it is *use the rod that best fits the individual job.* Generally, air-feed jackhammers and other small, light drills benefit from the use of alloy drill rods. For alloy rods have greater resistance to fatigue, higher elastic limits – important where smaller rod sizes are used.

Rod Stiffness . . .

Rigidity or stiffness can only be increased by enlarging the cross section of the rod. If you decrease the cross section you'll get more whipping no matter what type steel you use, or how you heat treat it. Therefore, don't use a ⅞" hexagon alloy rod when you've been using a 1¼" round carbon rod, unless an increase in flexing and less stiffness is unimportant.

Abrasion Resistance . . .

The higher the hardness the better a drill rod will stand abrasive wear. Alloy rods have the advantage in this respect, for they can be heat-treated to higher hardnesses than can carbon rods.

Notch Effect . . .

Notch effects caused by failure to overlap heats in treating shanks, or those caused by careless handling, chain marks or corrosion pits all cause rod failure. Alloy rods are more resistant to these nicks or notches than carbon steels, but when they do occur failure can be more rapid.

The answer to better drilling is simply this: choose the right drill rod, and then give it reasonable and proper care.

And for the *right* carbon or alloy hollow drill rods – in the sizes, shapes, and grades you need – Crucible is the place to go. *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

Visit us at Booth 201
American Mining Congress
Metal Mining Show—Oct. 1-4

CRUCIBLE first name in special purpose steels

Crucible Steel Company of America

E&MJ NEW PRODUCTS DIGEST

LLOYD E. ANTONIDES, Assistant Editor

Aerial Exploration

Used for electromagnetic surveying with helicopter, this 20-ft long cloth and fiberglass bird flies at 50-ft elevation; "copter," at 150 ft. Source and search coils are fixed vertically at 90 deg in opposite ends of bird. Unit is part of apparatus for measuring variation in phase and amplitude of generated field, caused by conductive materials. Finnish engineer, Vaino Ranka, developed it for Aeromagnetic Surveys Ltd., Toronto, Can., one of Hunting Group of companies.

Hycon Aerial Surveys Inc., Pasadena, Calif., is using it simultaneously with light weight version of their Varian Nuclear Precession magneotmeter and scintillation counter. Such surveys are used in areas too small for economical fixed-wing aircraft or too rough for low-flight safety. (1)

Hycon has also equipped several Cessna 195's with lightweight equipment for smaller surveys. (2)

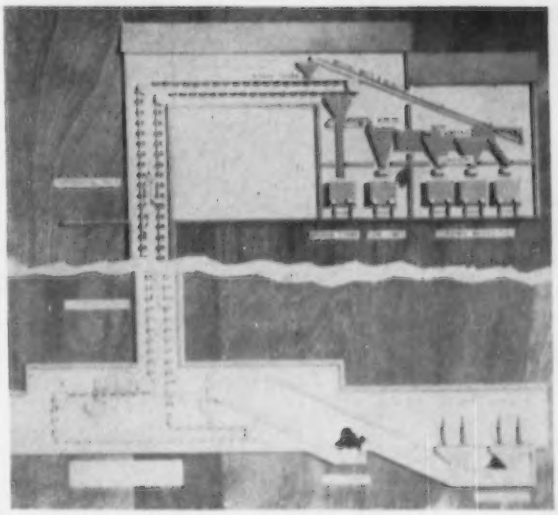
Bucket Shaft Hoist

Mitchell Engineering Ltd., London, England, claims to have developed a bucket hoisting system that has lower first and operating costs than conventional installations. Primarily designed for single level coal mines, it is stated as applicable to any depth and can lift 50 to 500 tph.

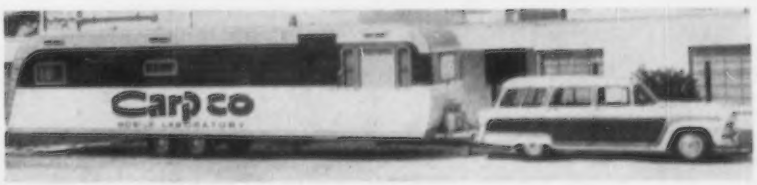
Bottom dump buckets, suspended between two double-link steel chains, are filled by rotary plate feeder at haulage level. At intervals in shaft—as well as at top and bottom—electric motors drive short chains. Dogs on these driving chains engage link studs on both rising and descending strands of carrying chain. Positive engagement of both strands reduces carrying chain tension, long an obstacle.

Alternate chain studs serve as bucket supports and pivots and also as axle for small wheel. Wheels support bucket and chain during horizontal movement.

Bottom dump buckets overcome chain stretching effect of tipping bucket dumps. Sealed bearings cut lubrication problems. (3)



AWARD-WINNING design of model HH Payloader of Frank G. Hough Co., Libertyville, Ill., was made by Jon W. Hauser, St. Charles, Ill. Automobile and medical meter were only other winners in 6th annual competition of Industrial Design Institute. (4)



MOBILE LABORATORY enables Carpco Manufacturing Inc., Jacksonville, Fla., to demonstrate and test right at your door. It contains equipment emphasizing specific gravity, electro-static and magnetic separation—fields in which the company specializes. Auxiliary equipment is also shown. (5)

Continued On Page 36. For More Information On Items, Use Card Opposite Page 42.

Tape Rule (7)

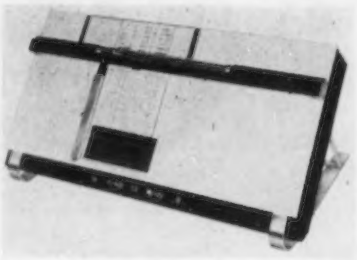
Vernier dial gives instantaneous readings with Rulo-matic pocket extension rule, according to Frederick Post Co., Chicago, Ill. White face is clear reading and small wheel is used for marking.

Spectrometer (6)

Low-cost grating type scanning spectrometer with better dispersion and resolution than conventional units is announced by Jarrell-Ash Co., Newtonville, Mass. Compact table unit is claimed ideal for trace element analysis.

Microscope-Telescope (8)

Pen-sized instrument from Edmund Scientific Corp., Barrington, N. J., combines 50 power microscope and 10 power telescope. For "mike" work, small reflector lights object. It has pocket clip.



Curve Calculator (9)

Equameter is electric analogue computer for finding equation of curves. It is inexpensive, gives direct readings and is simple to operate, says Gerber Scientific Instrument Co., Hartford, Conn.

Scintillometer (10)

Long-lived mercury batteries and all-transistor circuitry are features of scintillation detector by La Roe Instruments, Inc., Bethesda, Md. Lunch-box like unit is designed for up to 4-in. crystals and weighs under 7 lb.

Geiger Counter (11)

Multiple Geiger tubes coupled with photo-multiplier tube in Multi-Lokator, challenge sensitivity of scintillometer, says Radiac Co., N. Y., N. Y. Rugged, reliable, low-cost, et al. advantages of Geiger counter remain, it is claimed.

Multiplier Phototube (12)

Ultra-compactness of ¾-in. diam, ten stage multiplier phototube by Allen B. DuMont Laboratories, Inc., Clifton, N. J., is claimed a boon to drill hole probing. In past, comparable tubes were of considerably larger diameter.

Portable Core Drill (13)

Micro-Miner is gasoline powered rotary drill offered by Frank Tickner, Pittsburgh, Pa., for up to 100 ft. Its light weight, compactness and low price are claimed especially ideal for prospect coring. Pump unit is separate.

Rotary Drill (14)

Apex Drilling and Equipment Corp., North Hollywood, Calif., announce a heavy duty rotary rig, ADEC 200. Suitable for varied mounting, it drills 1 to 6-in. holes to 2,000 ft with 61-hp engine or power take off. It has 20-ft mast.

Self-Powered Sinker (15)

Gasoline-powered, 53-lb, self-contained Cobra rock drill is offered by Atlas Copco Eastern, Inc., Paterson, N. J. Drilling depth of compact unit is stated as 13 ft; rate in hard granite, as 26 fph. It uses air flush.

Self-Powered Sinker (16)

Smaller Pionjar—the 66-lb, BRH-50, gasoline powered rock drill now available from Stanco Mfgs. & Sales, Inc., Los Angeles, Calif.—is claimed to drill to 20 ft at 29.5 fph with 1.34-in. bit through medium hard granite.

Churn Drill (17)

Designed for 4-in. holes, "vest-pocket" churn drill from National Welding and Mfg. Co., Newington, Conn., weighs only 450 lb. It can be powered by ¾-hp electric motor or ½-hp gasoline engine and needs only 8-ft headroom.

Percussion Drill Bit (18)

Designed to fit directly on Gardner-Denver extension rods without adapter, 600-Series TC-insert Rok-Bit of Brunner & Lay, Inc., Philadelphia, Pa., has cross or "X" design in 2¾ and 3-in. size. "X" comes 2½ and 3½-in., too.

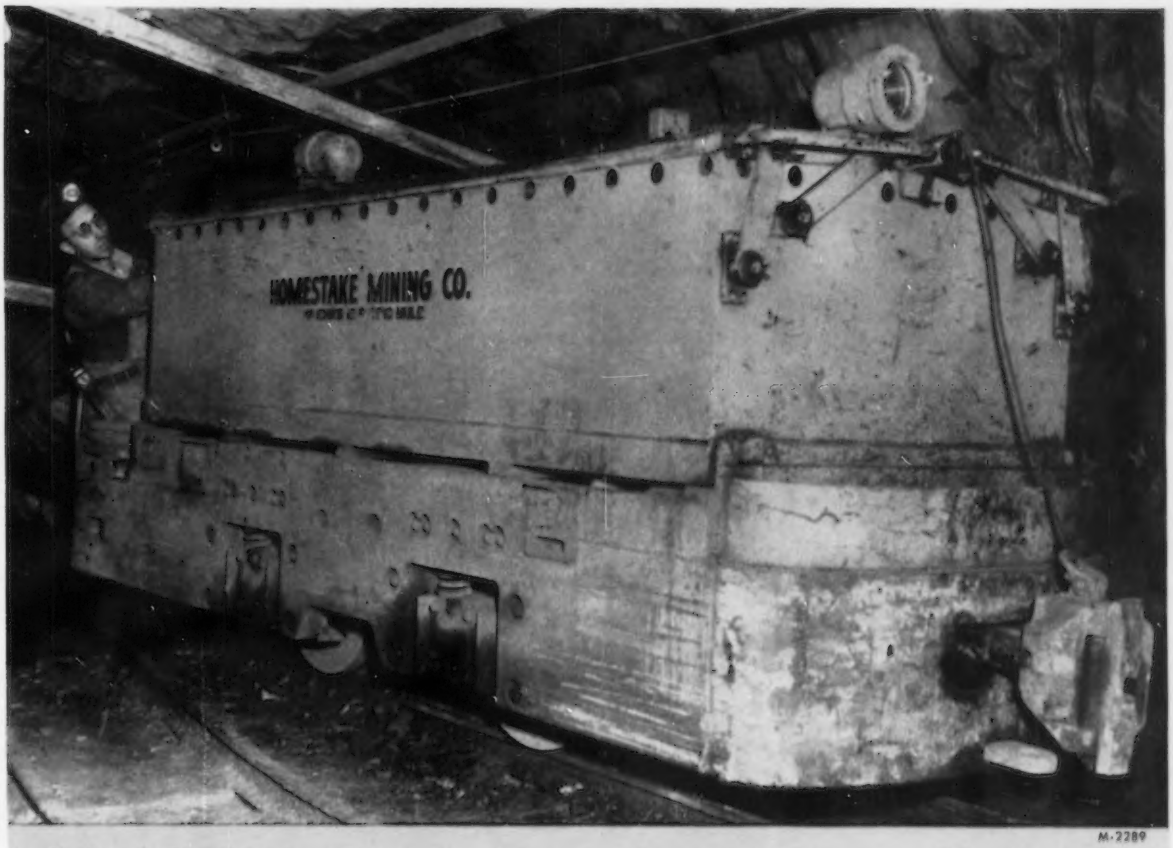
Sinker Drill (19)

Faster, stronger rotation for faster and deeper drilling is aim of modification on H-10 sinker by Le Roi Div., Westinghouse Air Brake Co., Milwaukee, Wis. New valve and valve block are interchangeable with original components.

Bit Grinder (20)

Floor or bench model of latest rock bit grinder by J. G. Blount Co., Everett, Mass., has two 14-in. wheels for machine held sharpening of all 3-in. or smaller detachable cross bits. Gaging wheel is on right.

Continued On Page 38. For More Information On Items, Use Card Opposite Page 42.



M-2289

MANCHA Solves Another Haulage Problem

MINE HAULAGE DATA:

Track Gauge	18"
Min. curve radius	25'
Grade	Level to .25%
Condition of track	Occasionally very slippery due to coating of slimes on rail from back filling operation.
Length of haul	2500 ft. from loading chute to shaft pocket.
Car Specifications Design	Granby type
Tare	2.15 tons
Capacity	3.6 tons
Size trip	20 cars
Tonnage desired	1000 tons in two haulage shifts.

LOCOMOTIVE DESIGN REQUIREMENTS:

Short wheel base for negotiating sharp radius curves. Length, width and height dimensions to suit mine cage, dumping ramp, and chute lip location.

Running speeds of 7-9 mph, loaded and empty trips. Ability to start loaded trips on curves and against grades with slippery rail conditions.

SOLUTION:

Mancha Hercules BX Storage Battery Locomotive—8½ ton operating weight with 2 motors for a total of 54 hp at 108 volts.

PERFORMANCE:

This Mancha locomotive has met all dimension limitations. It has pulled 25 loaded cars in one trip. It has hauled 650 tons in one shift and 1000 tons in two shifts. It has solved the problem of starting and accelerating on slippery rails by direct connection between axles plus sanders in front of leading wheels in each direction. And it has provided these additional design advantages: (1) safety for the motorman through hand operated hydraulic brakes for quick, positive braking; a deadman foot switch; heavy protective plate around cab. (2) mechanically cam-operated, heavy-duty controller with main line contacter to prevent dragging controller points and to reduce contact wear.

RESULTS:

Ten Mancha Hercules BX locomotives are currently in use at the Lead, South Dakota operation of the Homestake Mining Company.

There is a Mancha locomotive to do a profitable job in your mine. Let us analyze your requirements and make a recommendation. There's no obligation on your part.

MANCHA STORAGE BATTERY LOCOMOTIVE

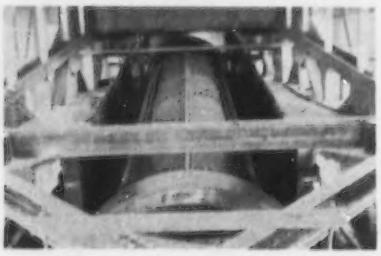
DIVISION GOODMAN MANUFACTURING COMPANY

Halsted Street and 48th Place • Chicago 9, Illinois • Cable Address: Mancha, Chicago

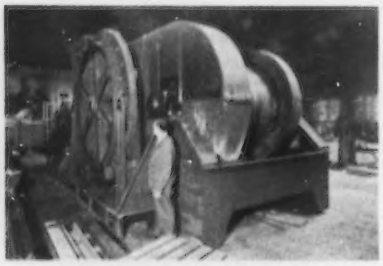
Mancha representatives are located in principal mining areas throughout the world.

YUBA

BUCKET LADDER AND HYDRAULIC DREDGES for dredging placer properties, harbor and levee construction, channel changes, production of sand and gravel. Hydraulic dredges from 6-inches up; bucket sizes: 2½ to 18 cu. ft., or larger. Digging depths below water as required.



ABRASION RESISTING STEEL SCREENS —flat or revolving for separating, scrubbing, sizing. Holes taper drilled to prevent clogging. All thicknesses from 3/16" up; other dimensions as needed. Abrasion resisting steel plates available from stock.



DOUBLE-DRUM HOIST, 1,000-ton capacity, built to handle 194-foot digging ladder, typifies heavy equipment Yuba can build for you.

For estimates, send us your drawings or specifications. No obligation.

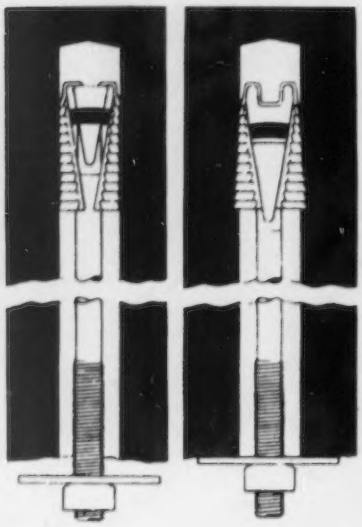
94

YUBA DREDGES — PROVED DEPENDABILITY

YUBA MANUFACTURING CO.

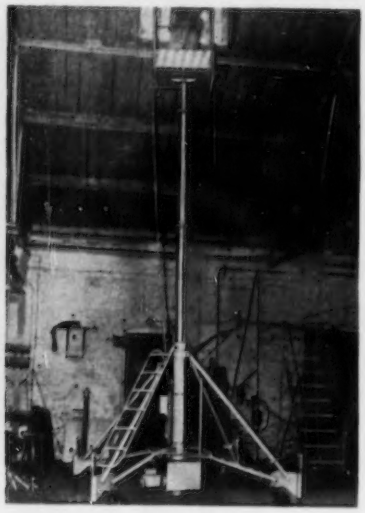
Room 600 • 351 California St. • San Francisco 4, Calif.

E&MJ NEW PRODUCTS DIGEST (*Continued*)



Rock Bolt (21)

Integral forged wedge forces halves of expansion shell apart when tension is applied to emplaced rockbolt in unique design by Republic Steel Corp., Cleveland, Ohio. The ¾-in. bolt sustains 20-ton pullout.



Access Lift (22)

Ballymore Co., Wayne, Pa., announces availability of mobile hydraulic access lifts designed for 42-ft reach. Base folds up for easy handling through narrow passages. Controls are on platform. It lifts 350 lb.

Loader Bucket Teeth (23)

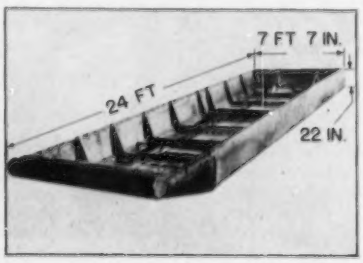
Clamp-on ripper teeth for loader bucket, speed work in hard packed material according to Hensley Equipment Co., Inc., San Leandro, Calif. Easily put on or taken off, they have replaceable wear points.

Dozer Blade (24)

"U"-shaped bulldozers, hydraulically controlled, are offered for D8 tractors by Caterpillar Tractor Co., Peoria, Ill. It is claimed more efficient for moving loads longer distances. Cable-type unit has been available for some time.

Wheeled Tractor (25)

Davis Pit-Bull is versatile gasoline or diesel powered tractor-loader from Mid-Western Industries Inc., Wichita, Kan. Crane, fork-lift, et al. attachments convert it to fit other jobs.



Steel Barge (26)

Specifications of utility steel barge: Weight, 1,750 lb; Capacity, 6 tons; Draft, 2¾ in.; steel, 14 gage with ⅛-in. ribs; Price $860 in quantity. Neptuna Corp., Glendale, Calif.

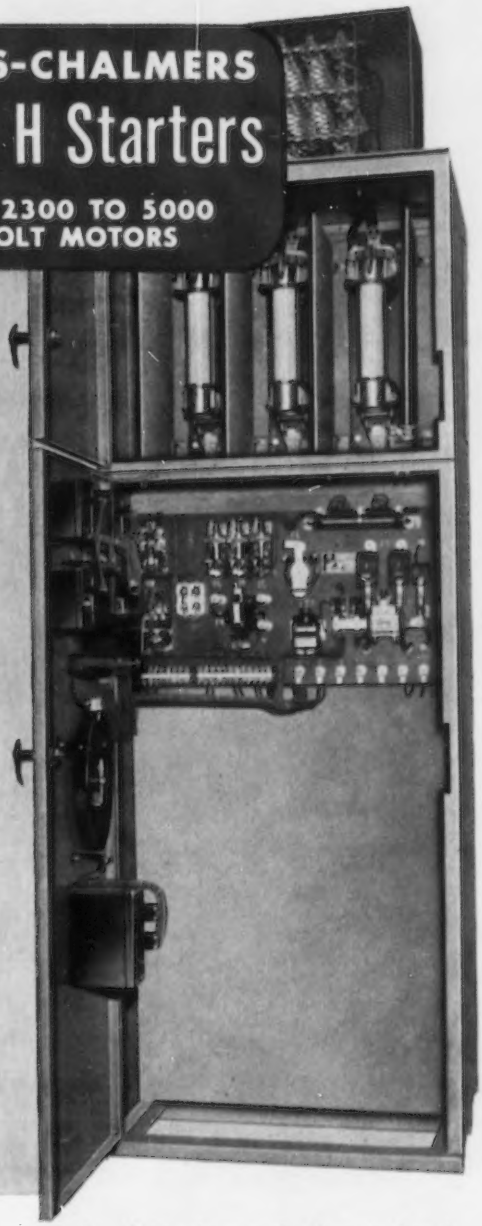
Continued On Page 40. For More Information On Items, Use Card Opposite Page 42.

CHOICE of CONTACTORS

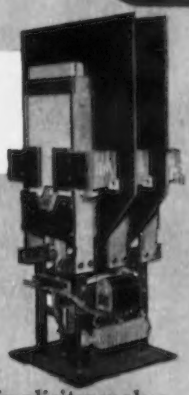
to meet your specific needs

Allis-Chalmers Type H Starters may be equipped with either air-break or oil-immersed contactors — installed in the same sized space.

ALLIS-CHALMERS
Type H Starters
FOR 2300 TO 5000 VOLT MOTORS

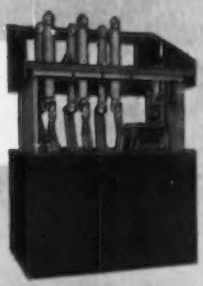


AIR



Designed for top performance on the rough-tough jobs. Advantage of contacts operating in air include long contact life, reduced fire hazard, easy maintenance. Double-break contacts, vertical action and dual blowouts provide long, dependable operation. Design simplicity makes contactor particularly adaptable for applications requiring frequent starting, inching, reversing, or dynamic braking.

OIL



Meets operating demands of semi-hazardous locations. Contactor operates under oil to prevent sparks from igniting atmosphere and to protect mechanism from corrosion. Contactor is time-proved clapper type. Self-cleaning, rolling-wiping action extends contact life. Self-aligning E-type magnet provides perfect armature seating . . . quiet, maintenance-free operation.

LIVE BETTER ELECTRICALLY

YOU GET MORE...

Allis-Chalmers offers help on specific control application problems. Call your Allis-Chalmers representative. His recommendations are backed by Allis-Chalmers engineering departments . . . by the experience gained in solving thousands of control problems . . . by complete research and testing facilities.

For complete information on the Type H starter, write for Bulletin 14B6410B — Allis-Chalmers, General Products Div., Milwaukee 1, Wis.

A-C ALLIS-CHALMERS

ALLIS-CHALMERS

A-4976

Crane-Excavator (27)

Construction Machinery Div., Clark Equipment Co., Benton Harbor, Mich., offers, among other features, 25-ton rating, new chassis and new power train on Michigan T-24 wheeled crane.

Backhoe Attachment (28)

Built exclusively for heavy-duty use on Terra Trac crawler tractors, hydraulic backhoe from American Tractor Corp., Ft. Wayne, Ind., has clean design. Low-cost is only one of cited features.

Dump Trailer (29)

All-aluminum trailer dump body made by Perfection Steel Body Co., Galion, Ohio, is claimed a first. One ton dead weight was saved on 20x8x4-ft welded box meant for sand and gravel haul.

Engine Air Filter (30)

Micronic, dry type engine air filter, is claimed highly efficient replacement for oil bath type by Purolator Products, Inc., Rahway, N. J. Simple design is said to make cleaning especially easy.

Tire Valve (31)

One valve now replaces 16 different types formerly used on Goodyear tubeless tire rims. It fits smallest truck or largest earth-mover rims and is simpler and lower cost.

Hub Set (32)

For three 4-wheel drive trucks, International Harvester Co., Chicago, Ill., now offers manually operated front-wheel hubs to control engagement of wheels with drive shaft and thus cut drag.

Conveyor Chain (33)

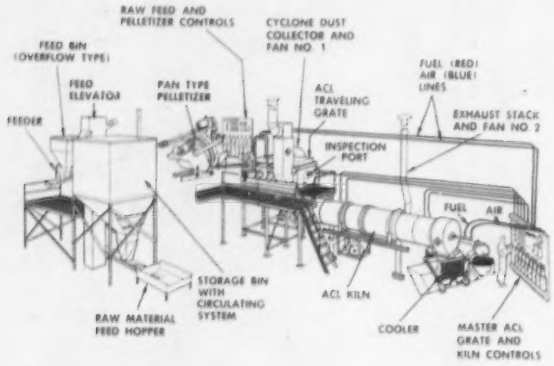
For heavy conveying, rivetless forged chain of Transue & Williams Steel Forging Corp., Alliance, Ohio, weighs 16 lb per ft with breaking tensile strength of over 100 tons. Smaller sizes are also available.

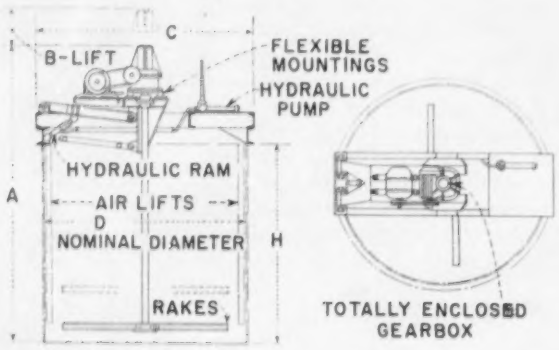
Conveyor Belting (34)

Nylon-filled rayon gives muscle to latest addition of long-flight conveyor belting by B. F. Goodrich Industrial Products Co., Akron, Ohio. Formerly, for equal strength, steel cable reinforcement was needed, it is said.

Conveyor Roll Bearings (35)

Line of ball bearings specifically for belt conveyor rolls, is offered by Marlin-Rockwell Corp., Jamestown, N. Y. Both inboard or outboard types have special lubricant seals which are claimed especially efficient.



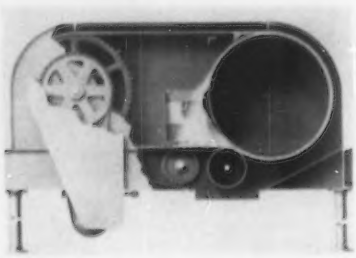


Sintering Plant (36)

Pilot plant shows compactness of ACL system for making cement clinker. Set up at Heat Processing Laboratory of Allis-Chalmers Mfg. Co., Milwaukee, Wis., it has three key parts—pelletizer, traveling grate, kiln. Lowest fuel cost and dust loss of any process, is claim.

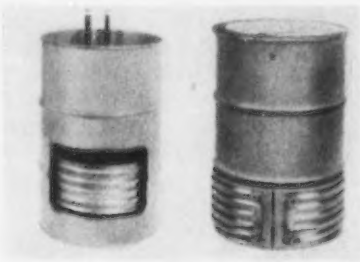
Agitators (37)

Hydraulic high-lift rake agitator, claimed low in first and operating costs, is offered by Warman Equipment (W. A.) Pty Ltd., Kalgoorlie, West Australia. Load on bearings and supports is reportedly cut by balancing gear drive around single drive-rake shaft. Propeller type is also offered.



Jaw Crushers (38)

Jawmaster line of thirteen sizes of high capacity jaw crushers from 10x16-in. to 40x48-in. is announced by McLanahan and Stone Corp., Hollidaysburg, Pa. Overhead eccentric type has long jaws with force-feed action, it is said.



Drum Dryer (39)

Material passing from feed to outlet sides of Drumulator is repeatedly dried between heated rotating drum face and moving stainless steel belt. It is plowed off and along face after each pass around 2/3 of drum. Jeffrey Mfg. Co., Columbus, Ohio, cites compactness, simple foundation, no agglomerating, et al.

Laboratory Mixer (40)

Pug mill for mixing small quantities of hot or cold, wet or dry materials is development announced by Lindcraft Corp., St. Louis, Mo. Efficient, compact and less expensive than others are claims made for unit. It is driven by ¾-hp 110v motor with variable speed drive.

Heating Element (41)

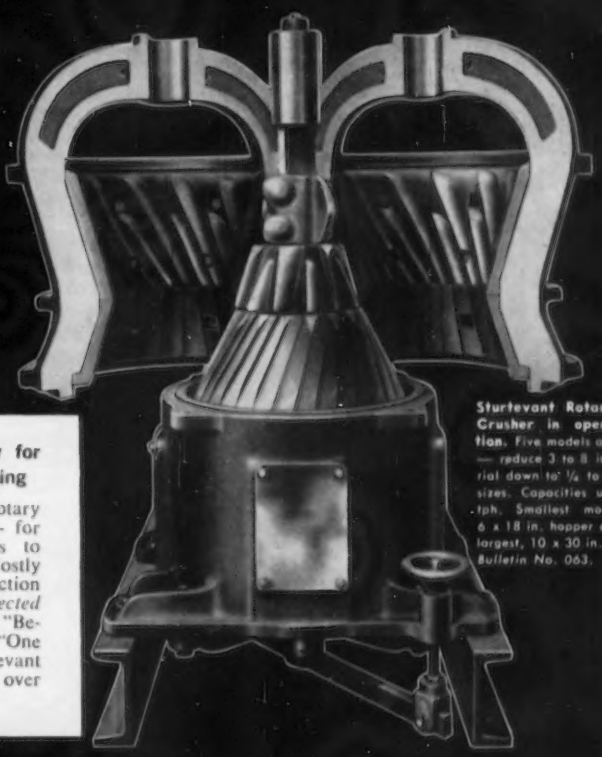
Thermo-Panel coil is claimed to outmode old-fashioned pipe coils by heating or cooling more economically. Easily handled and easily cleaned it consists of two sheets of suitably embossed metal welded together to form flow channels. Any size and metal fabrication is offered by Dean Products Inc., Brooklyn, N. Y.

Continued Opposite Page 42. For More Information On Items, Use Card Opposite Page 42.

PRODUCTION ALWAYS ON SCHEDULE

Thanks to

"OPEN-DOOR" DESIGN



Sturtevant Rotary Fine Crusher in open position. Five models available — reduce 3 to 8 in. material down to ¼ to 1¼ in. sizes. Capacities up to 30 tph. Smallest model has 6 x 18 in. hopper opening; largest, 10 x 30 in. *Request Bulletin No. 063.*

"One Man, One Minute" Accessibility for Inspection, Clean-outs, Trouble-shooting

One man can swing open a Sturtevant Rotary Fine Crusher in a matter of minutes — for inspection and maintenance — thanks to Sturtevant's unique "Open-Door" design. Costly downtime is cut to a minimum, production kept on schedule — *even when the unexpected happens.* Little wonder that users say: "Because of their rugged construction and "One Man, One Minute" accessibility, Sturtevant machines give us *lower* operating costs over *more* years."

STURTEVANT ROTARY FINE CRUSHERS REDUCE SOFT TO SEMI-HARD MATERIALS FASTER, MORE ECONOMICALLY

For uniform crushing of soft (clay, charcoal) to moderately hard materials (softer limestone, cement clinkers), the Sturtevant Rotary Fine Crusher is practically non-clogging — much faster than other machines, less costly to operate.

Smooth production flow. The single turning of a hand wheel regulates the output size (from ¼ to 1¼ in. on largest model) — provides a uniform product, dustless operation, steady output for greatest production efficiency.

A lifetime of low-downtime service. Built into Sturtevant Rotary Fine Crushers is Sturtevant's 83 years of successful engineering of dry processing units and equipment. Rugged construction, plus easy accessibility provided by Sturtevant's unique "Open-Door" design, assures more output per machine year.

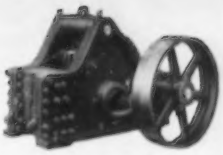
Write today, Address: Sturtevant Mill Company, 101, Clayton St., Boston 22, Mass.

STURTEVANT

Dry Processing Equipment

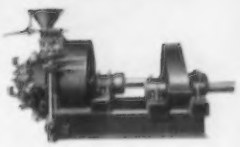
The "OPEN-DOOR" to *lower* operating costs over *more* years

CRUSHERS • GRINDERS • MICRON-GRINDERS • SEPARATORS
BLENDERS • GRANULATORS • CONVEYORS • ELEVATORS



JAW CRUSHERS

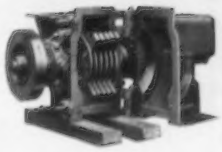
Reduce coarse (5 in. largest model) to fine (⅛ in. smallest model). Eight models range from 2 x 6 in. jaw opening (lab model) to 12 x 26 in. Capacities to 30 tph. All except two smaller sizes operate on double cam principle—crush twice per energy unit. *Request Bulletin No. 062.*



RING ROLL MILLS

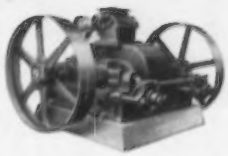
Reduce hard or soft 1½ in. and smaller material to from 6 to 200 mesh. Grind only — no screens. Capacities of 3 models range up to 18 tph, depending on model and material. Ring diameters and faces 24 x 7 in.; 45 x 8 in.; 44 x 14 in. *Request Bulletin No. 079.*

ALL STURTEVANT MACHINES ARE DESIGNED TO OPERATE ADVANTAGEOUSLY IN "UNITS"



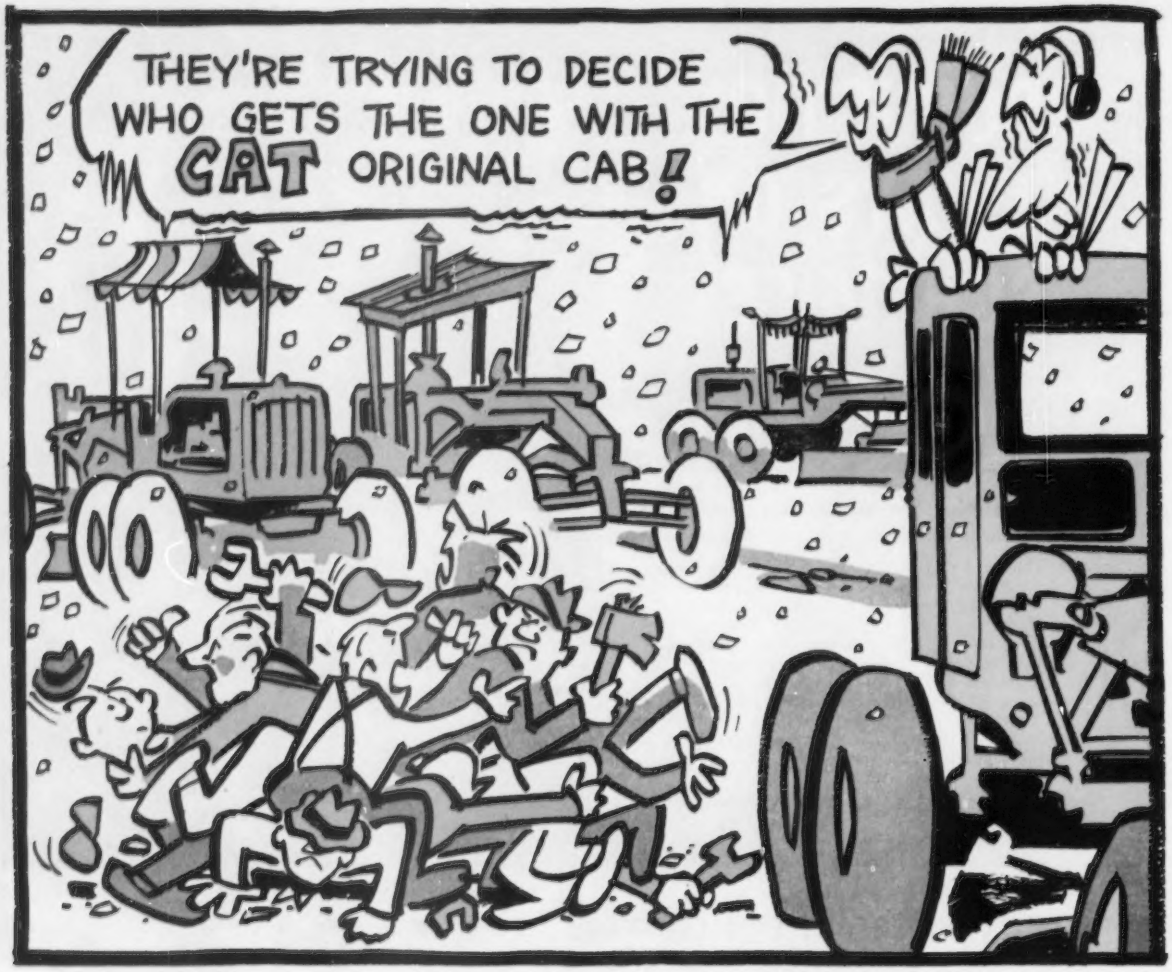
HAMMER MILLS

Reduce to 20 mesh. Swing-Sledge Mills crush moderately hard material up to 70 tph. Hinged-Hammer Pulverizers crush softer material at rates up to 30 tph. Four Swing-Sledge Mills with feed openings from 6 x 5 in. to 20 x 30½ in. Four Hinged-Hammer Pulverizers from 12 x 12 in. to 12½ x 24 in. *Request Bulletin No. 084.*



CRUSHING ROLLS

Reduce soft to hard 2 in. and smaller materials to from 12 to 20 mesh with minimum fines. Eight sizes, with rolls from 8 x 5 in. to 38 x 20 in.; rates to 87 tph. Three types — Balanced Rolls for automatic adjustment in operation; Plain Balanced Rolls, Laboratory Rolls. Recomended for 3 to 1 reduction. *Request Bulletin No. 065.*



Thinking of an attachment for your Caterpillar machine?

Be sure of these points: Is it ruggedly built—as ruggedly built as the big yellow machine it'll work with? Does it attach and detach easily? Is it designed with your operator's safety in mind? Is it *complete*, or will it need special fittings?

CAT* attachments fill the bill every time. They increase operator comfort and convenience—which means increased efficiency. You get *more work* out of your machine.

See your Caterpillar Dealer's Parts Representative for information and catalogs on the complete line of Cat original attachments for your machines.

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

Cat all-weather steel cabs are tailored to fit exactly your Caterpillar-built Tractor and Motor Grader. Simple to install, yet they afford maximum vision while keeping out wind, snow, sleet, rain and dust.

CATERPILLAR*

*Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.

CENTRIFUGAL DRYER, offered by Hanson-Van Winkle Mining Co., Matawan, N. J., handles loads to 70 lb, can be electrically air-heated and is V-belt driven by ½-hp motor. **(42)**

REAGENT FEEDER PUMP, that is claimed first completely corrosion-resistant, is being produced by Clarkson Co., San Francisco, Calif. Rigid PVC is used. Handles to 25 gph. **(43)**

GAS TURBINE, small enough to fit in duffel bag and weighing only 175 lb yet rated at 100 hp, is announced by Garrett Corp., Los Angeles, Calif. It is general purpose power unit. **(44)**

GAS TURBINE, Mark TA, of Clark Bros. Co., Olean, N. Y. is stationary type unit, developing 1,130 brake hp. It is claimed unusually light and compact and of simple design. **(45)**

POWER TRAIN for up to 325 lb-ft engine torque, of Clark Equipment Co., Jackson, Mich., is designed for off-highway and stop-go. TransVerter is compact "package" of torque converter, clutch and transmission. **(46)**

TROLLEY BUS-WAY, Lec-Trol-Feed, more safely supplies power to hoists et al. moving units, says Electric Service Mfg. Co., Philadelphia, Pa. Hood and arrangement of three conductors is cited. **(47)**

SPACE HEATER line called Cub by Silent Glow Burner Corp., Hartford, Conn., consists of portable recirculatory blowers delivering from 120,000 to 300,000 Btu. Cubs are claimed very low cost and versatile. **(48)**

AIR CONDITIONER for explosion hazardous areas is announced by Conditioned Air Inc., Charleston, W. Va. Units come in 3, 5½ and 7½-ton sizes for Class I Group D areas. **(49)**

FLOWMETER - DENSITOMETER that weighs liquid or gas passing through pipe by pumping to give precise angular velocity, using turbine to throttle velocity and then using this throttling torque as measure of mass, is product of Inertial Instruments, Inc., Santa Monica, Calif. Ni-Span C springs—unaffected by temperature—are key elements in compact, 6-lb ultra-precise device. **(50)**

SCALE and weigh batching instrument line announced by Fairbanks, Morse & Co., Chicago, Ill., uses electronic load cells. Fast accurate weighing devices lend themselves to automation. **(51)**

PROTECTIVE CLOTHING permitting work in kilns at 1,200 deg F, was demonstrated by Minnesota Mining & Mfg. Co., St. Paul, Minn. Aluminum coating is on fiberglass quilting. **(52)**

PROTECTIVE CLOTHING, force ventilated, for long working periods in plus 130 deg F, is offered by Union Industrial Equipment Corp., White Plains, N. Y. Ducts in flame-resistant coveralls take 225± cfm of air at 100± psi. **(53)**

PROTECTIVE CLOTHING, called Temp-Tron undergarments, are designed for sub-zero comfort. Budd Insulated Products Co., N. Y., N. Y., makes the light-weight balloon cloth-mixed fiber quilted suits. **(54)**

EAR PLUGS, of new design to combat dangerous noise, are available from Hartford Ear & Acoustic Laboratories, Hartford, Conn. **(55)**

WELDING REGULATORS, low-cost, compact inverse-type, for oxygen and acetylene, by Air Reduction Co., Inc., N. Y., N. Y., are designed for smaller shops. **(56)**

TEMPERATURE INDICATING crayon for 575 deg F has been added to wide line of such material—including lacquer and pellets—from Tempil Corp., N. Y., N. Y. **(57)**

FASTENER SCREW called Spherelock locks in place by friction when curved key in slot in head is flattened. It eliminates cotter pins in bolts says Bellford Metal Products Inc., Cleveland, Ohio. **(58)**

BRAKE LINING, flexible molded, is single type designed for both internal and external drums on winches, etc., by Raybestos-Manhattan Inc., Bridgeport, Conn. **(59)**

For Your Files

This informative manufacturers' literature is free unless otherwise specified. To obtain bulletins circle their numbers on card at right and mail.

X-RAY SPECTROSCOPY is lucidly explained in special issue of Norelco Reporter, bi-monthly magazine of North American Phillips Co., Inc., Mt. Vernon, N. Y. **(61)**

PLASTICS FABRICATION is subject of bi-monthly magazine from American Agile Corp., Cleveland, Ohio. It covers welding, forming, etc., of pipe, sheet, etc. **(62)**

"WINDSTORM DAMAGE Prevention" is interesting informative booklet issued by National Board of Fire Underwriters, N. Y., N. Y. **(63)**

EARTHMOVING with bulldozers is topic of brief brochure from Cater-

SEPT. 1956

NOT GOOD AFTER NOV. 1, 1956
if mailed in U. S. or Canada

Please send me the catalogs or further information about the items from New Products Digest whose numbers are circled.

1	15	29	43	57	71	85
2	16	30	44	58	72	86
3	17	31	45	59	73	87
4	18	32	46	60	74	88
5	19	33	47	61	75	89
6	20	34	48	62	76	90
7	21	35	49	63	77	91
8	22	36	50	64	78	92
9	23	37	51	65	79	93
10	24	38	52	66	80	94
11	25	39	53	67	81	95
12	26	40	54	68	82	96
13	27	41	55	69	83	97
14	28	42	56	70	84	98

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Please send me the catalogs or further information about the items from New Products Digest whose numbers are circled.

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E&MJ NEW PRODUCTS DIGEST *(Continued)*

pillar Tractor Co., Peoria, Ill. Blade design explanation and estimated production table are informative. **(64)**

RIGID PLASTIC PIPE installation is topic of bulletin from B. F. Goodrich Co., Marietta, Ohio. It covers high chemical resistant, rigid Koroseal pipe and fittings. **(65)**

ASBESTOS-CEMENT PIPE installation manual for supported industrial process lines is offered by Johns-Manville Corp., N. Y., N. Y. It shows inert Transite has versatile uses. **(66)**

ARC WELDING handbook on stainless steels, non-ferrous metals, cast iron and manual hardfacing is latest addition to "meaty" Welddirectory series of Lincoln Electric Co., Cleveland, Ohio. **(67)**

WIRE ROPE SHEAVES, 6 to 24-in., called Durolite by Sauerman Bros, Inc., Bellwood, Ill., are cataloged in small folder. **(68)**

ABRASIVE WHEELS for grinding carbide tools are cataloged in folder from Robertson Mfg. Co., Trenton, N. J. **(69)**

RECIPROCATING PUMPS, steam driven, of Dean Brothers Pumps Inc., Indianapolis, Ind., are cataloged in brochure. They are for high pressure service. **(70)**

CENTRIFUGAL PUMPS for up to 2,800 gpm and 525-ft head are described in catalog on CRV line from Ingersoll-Rand Co., N. Y., N. Y. **(71)**

HOSE & FITTINGS from Aeroquip Corp., Jackson, Mich., are shown in condensed catalog. Ordering instructions on the various products for various fluids are given. **(72)**

AIR CONTROL VALVE catalog is offered by Airmatic Valve Inc., Cleveland, Ohio. Gamut of styles and types included in the 72 pages is enormous. **(73)**

WHEELED TRACTOR, DW20, performance is covered in brochure from Caterpillar Tractor Co., Peoria, Ill. Run down on matched scraper is informative. **(74)**

WIRE ROPE seizing is simple and strong with steel locking-collars called Dualoc wire rope ending. Folder from American Chain & Cable Co., Inc., Bridgeport, Conn., describes them. **(75)**

BIT GRINDER, designated Style 49-A, for mining tools, is described in folder from Ex-Cell-O Corp., Detroit, Mich. Particular reference is made to carbide-tipped tools. **(76)**

VIBRATING BAR GRIZZLY of Nordberg Mfg. Co., Milwaukee, Wis., is described in bulletin. Compact, heavy duty scalper has capacity to 1,000 tph. **(77)**

SLURRY DENSITY CONTROL using radioactive source and counter minimizes maintenance and is simple to install according to application bulletin on Gammagage from Isotope Products, Buffalo, N. Y. **(78)**

HEAT EXCHANGER, called Aero, by Niagara Blower Co., N. Y., N. Y., uses air blowers and water spray to cool process liquids. No cooling tower is needed and it reputedly saves 95% of water normally used. Bulletin is offered. **(79)**

DIESEL ENGINES, 5 to 250 hp, of Klockner - Humboldt - Deutz A.G., Cologne, Germany, are compact, air-cooled, general purpose prime drivers. Many component parts of line are standardized. It will run on gasoline as well, according to data sheets. **(80)**

DIESEL ENGINES in 251 series, 550 to 2,400 hp, are covered in bulletin from Alco Products Inc., Schenectady, N. Y. It is a really modern heavy duty power plant. **(81)**

SYNTHETIC COMPOUNDS of Kel-F fluorocarbon, have amazingly varied properties whether in solid or liquid forms. Read about them in 8-page brochure from M. W. Kellogg Co., Jersey City, N. J. **(82)**

DRILL STEEL spiral rolling process for increasing service life of all components, is available for licensing. Descriptive literature is available from T. W. Wlodek, Ottawa, Canada. **(83)**

FLOTATION MACHINES with two impellers on single shaft—one for aeration, one for agitation—are described in folder from Booth Co., Inc., Salt Lake City, Utah. Other folders describe lab-sample pressure-filter and testing and engineering services. **(84)**

TRAVELING PAN FILTER of Dorr-Oliver Inc., Stamford, Conn., is neatly described in leaflet. Flexible capacity, gravity feed, and sharp filtrate separation are cited as advantages of their recently introduced unit. **(85)**

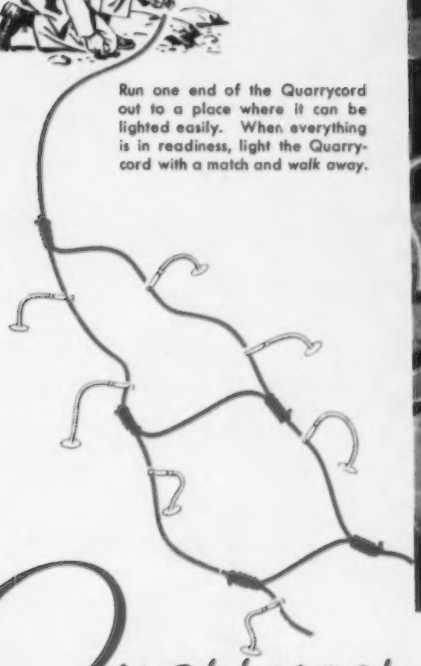
COLD WATER DEAERATORS are used to fight corrosive action of cold industrial water by removing dissolved oxygen and carbon dioxide from system without heat. Cochrane Corp., Philadelphia, Pa., describe their unit in folder just released. **(86)**

"TRENDS IN EQUIPPING the American Worker" is a fact-filled booklet offered by Council for Technological Development, Chicago, Ill. **(87)**

SERVICES & EQUIPMENT for mine and process plants, available from Western Machinery Co., San Francisco, Calif., are covered in two bulletins. One is a concise general catalog brochure. The other is a series of photos of some projects. **(88 & 89)**

HOSE SELECTOR for small rubber covered hose is offered by Lee Rubber & Tire Corp., Youngstown, Ohio. Starting with any of various specifications, it shows proper Wiretex to use. **(90)**

Run one end of the Quarrycord out to a place where it can be lighted easily. When everything is in readiness, light the Quarrycord with a match and *walk away.*



Quarrycord

for one-shot lighting of safety fuse in secondary blasting

(PLEASE GIVE THIS ADVERTISEMENT TO YOUR BLASTING FOREMAN)

Now you can ignite each and every safety fuse from *one point*, and eliminate the hazard of men climbing over the rock pile, lighting each fuse individually.

Now you can have the advantage of fuse blasting, so that the holes go "pop-pop-pop" rather than "BOOM" — to reduce the noise of a single blast.

Now you can fire when convenient, without fear of stray electrical currents causing premature blasts.

Quarrycord is a flexible, water-resistant cord which burns with an external flame at the rate of about one foot per second.

It is very easy to use: (1) Prepare each primer cartridge in the usual way with safety fuse and detonating cap. (2) On the end of the fuse opposite the cap place a Quarrycord Connector. (3) Load and tamp the holes. (4) When ready to blast, run a line of Quarrycord so as to connect with each hole (5) At each fuse, pass the Quarrycord into the slot in the end of the connector and press the "lid" down *tight* over it to make positive contact (6) If your hook-up has parallel lines of Quarrycord, make frequent cross connections as shown.

Quarrycord is packed on spools in 500 foot lengths, two spools to a box. Connectors are supplied in cardboard boxes containing 100 each.

For more information see your Explosives Supplier, or write to

THE ENSIGN-BICKFORD COMPANY
Simsbury, Connecticut

Manufacturers of Primacord® Detonating Fuse, Safety Fuse, Ignitacord®, Blasting Accessories.

Established 1836

Free Folder tells the whole story: what it does, and how to use it. Every Blaster should have a copy — send for it today.

ENSIGN-BICKFORD Quarrycord *for lighting Safety Fuse in Secondary Blasting*

Q-4

Four 8-Ton Plymouth Diesel Mine-O-Motives working round the clock for Coker-Kiewit joint venture contractors keep Genesee Tunnel advancing at rate of 85 feet per day.

PLYMOUTH MINE-O-MOTIVES WORK 24 HOUR DAYS

—Keeps hard rock tunnel project moving day and night!

Hard rock tunneling demands the utmost from both men and machines and joint-venture contractors Cooker Construction Company and Peter Kiewit Sons' Company have found the Plymouth Diesel Mine-O-Motives ready and capable of delivering the utmost in haulage performance for three full shifts per day. Operating and maintenance costs are low in spite of this rugged schedule. Diesel fuel consumption averages as low as 10 gallons for 24 hours of operation.

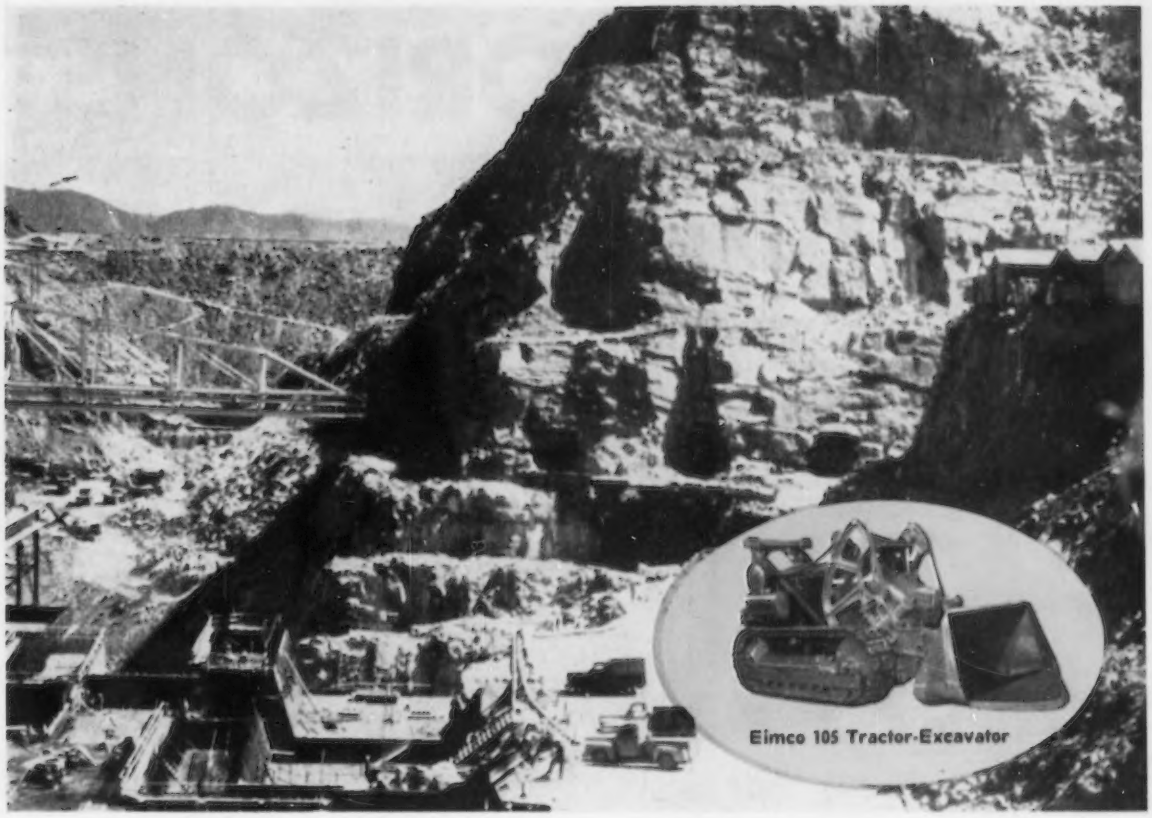
Exhaust scrubbers plus hydraulic torque-converter drive make the Mine-O-Motives the smoothest, lowest cost performers ever developed for mine and tunnel operations. Explosion-proof models available for gasous type mines or tunnels. Plymouth Mine-O-Motives are available in all gauges from 3 to 12 tons, other Plymouth Locomotive models, gasoline or Diesel, from 3 to 70 tons.

Get the full story on Plymouth Mine-O-Motives today. Outline your haulage problems, there is a Plymouth designed to exactly meet your needs. Address: Plymouth Locomotive Works, Division of The Fate-Root-Heath Company, Dept. A-22, Plymouth, Ohio.

PLYMOUTH®
MINE-O-MOTIVE

"These Plymouths are fast and reliable . . .

save on maintenance, too!" says W. H. Nixon, Project Manager for Coker-Kiewit on the 4 mile Genesee Tunnel Project. "Plymouth Mine-O-Motives have saved us a considerable amount over other types of underground handling methods."



INDIA – EIMCO 105's KEEP GRUELLING SCHEDULE

Two Eimco 105 Tractor-Excavators have each worked 8,000 hours in 12 months to keep progress on schedule at a huge dam project in India.

The machines have received intelligent maintenance and repairs have been small.

Eimco 105 Tractor-Dozer

At work on diversion, penstock and highway tunnels, trained Indian crews operating the 105's are doing an excellent job of tunnel driving. In some instances, advance for the size of tunnel being excavated may establish new world records.

"Eimco 105's are preferred equipment to use for tunnels of this type," says one official of a contracting firm. "The transmission, clutches and drive on both machines have not been touched in 8,000 hours of operation. They are in good condition and we expect them to last many more years."

Have you considered why the Eimco 105 is "preferred equipment" to contractors of huge dam, tunnel and road projects in the export market?

It's becauuse their dependability is reflected through their engineered strength to stay on the job around the clock – day in and day out.

The Eimco 105's dependability eliminates the necessity of a sizeable parts depot. Eimco's are built to 100,000 hour standards for service in remote areas. Time saved by Eimco's working continuously with no down time for repairs is a big factor in selecting equipment.

Conditions being equal, Eimco 105's will produce more at less cost and in less time than comparative equipment. Let Eimco show you how this versatile unit can outperform and out-work heavier, more expensive units.

See the Eimco 105 before you buy any crawler tractor equipment.

THE EIMCO CORPORATION

Salt Lake City, Utah—U.S.A. • Export Offices: Eimco Bldg., 52 South St., New York City

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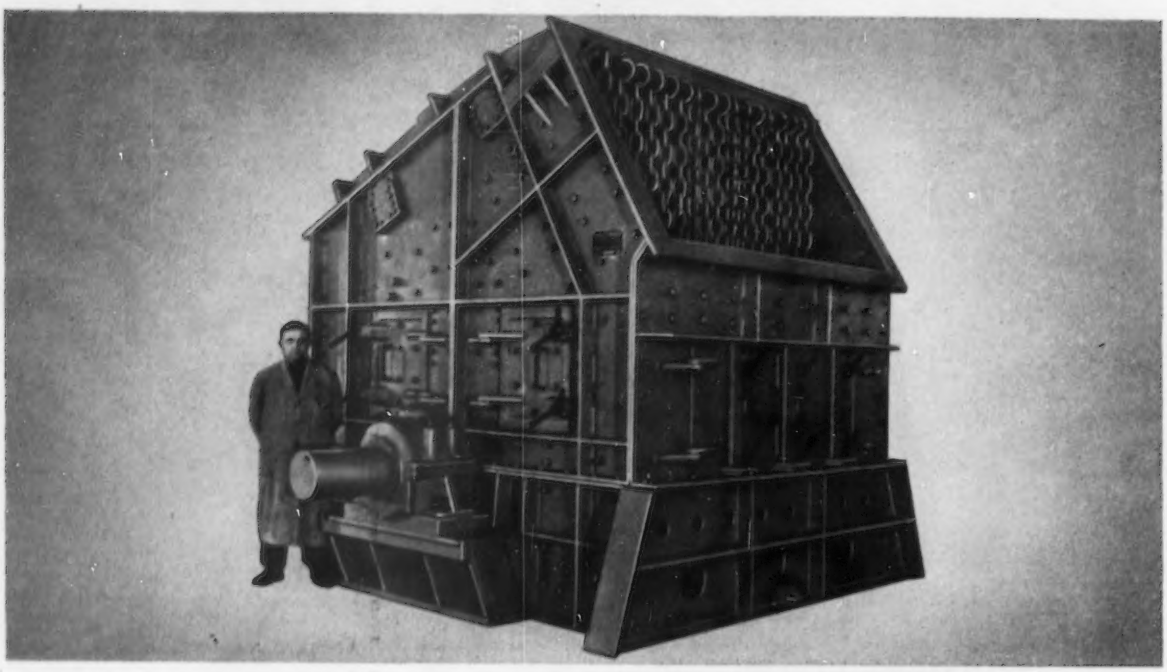
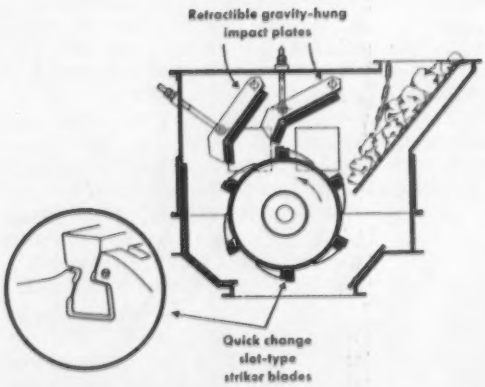
EIMCO

B-214

WIDER HORIZONS



FOR *IMPACT* CRUSHING



HAZEMAG IMPACT CRUSHERS utilize heavy rotating masses, lower impact speeds, and "open" construction to reduce blade and liner wear. It is now economically practicable to crush **BY IMPACT** a wide range of ores and minerals, with these benefits:

- **High Reduction Ratio**—HAZEMAG "multi-stage" crushers usually eliminate one or more stages—save on initial equipment cost.
- **Sturdy and Simple Construction** (only one moving part)—saves on maintenance.
- **Selective Crushing** (the hall mark of the impactor)—takes full advantage of natural cleavage—assures better ore pre-concentration—lower grinding cost.
- **Foreign Bodies**—a simple mechanism provides sure-fire protection.
- **High capacity**—Small space requirement—Light foundation.

OVER 1200 HAZEMAG IMPACT CRUSHERS NOW INSTALLED ALL OVER THE WORLD

HAZEMAG M·B·H· IMPACT CRUSHERS RAPID DRYERS

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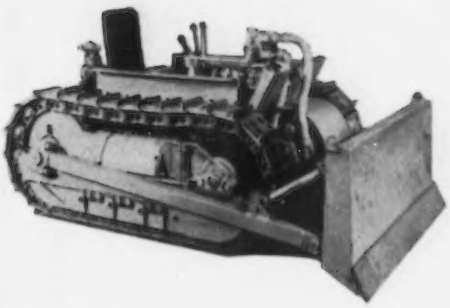
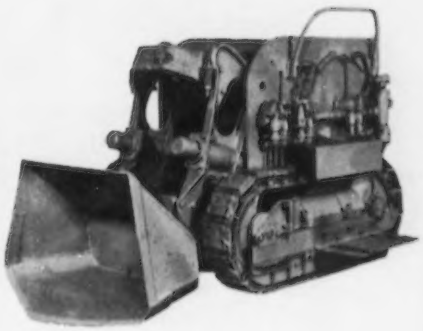
NOW! IN CRAWLER TYPE MACHINES FOR TRACKLESS WORK, THE SAME HEAVY RUGGED CONSTRUCTION AND DEPENDABILITY THAT THE INDUSTRY HAS HAD IN EIMCO WHEEL TYPE MACHINES.





Fast, sharp maneuvers, regulated by fingertip control make the EIMCO 630 EXCAVATOR a production giant and an operator's delight.

With the power at his fingertips to move one track into forward motion while the other is in reverse motion, an operator can make the 630 veritably "walk" around a muck pile—working from any angle without backing to make a new approach.

Eimco 630 agility permits operators to quickly master movement of the machine to a point that lost motion is eliminated between excavating and discharge stages.

While the 630 is moving between points of excavation and dumping, the bucket progressively elevates in an arc. Through proper timing, arrival of the 630 and bucket discharge become simultaneous operations. And the large half-yard bucket provides greater tonnage at every discharge.

These three pluses—extra maneuverability, operational ease and larger bucket capacity added in terms of economic value to you mean MORE TONNAGE IN LESS TIME.

THE EIMCO CORPORATION

Salt Lake City, Utah—U.S.A. • Export Offices: Eimco Bldg., 52 South St., New York City

New York, N. Y. Chicago, Ill. San Francisco, Calif. El Paso, Tex. Birmingham, Ala. Duluth, Minn. Kellogg, Ida. Baltimore, Md. Pittsburgh, Pa. Seattle, Wash. Pasadena, Calif. Houston, Texas Vancouver, B. C. London, England Gateshead, England Paris, France Milan, Italy Johannesburg, South Africa

B-215

This Crane valve on superheated steam since 1946—with no maintenance

You'll spot cost-saving performance in the record behind this Crane valve—it has been on duty an even decade of years, with no maintenance at all!

Neches Butane Products Company installed this Crane 8-inch, 900-pound Pressure-Seal angle stop-check valve in 1946 in its butadiene plant in Texas. On superheated steam boiler service, this valve has never failed to close tightly and surely—and operate smoothly and easily—with no sticking, no troubles—no need to go near it with a wrench.

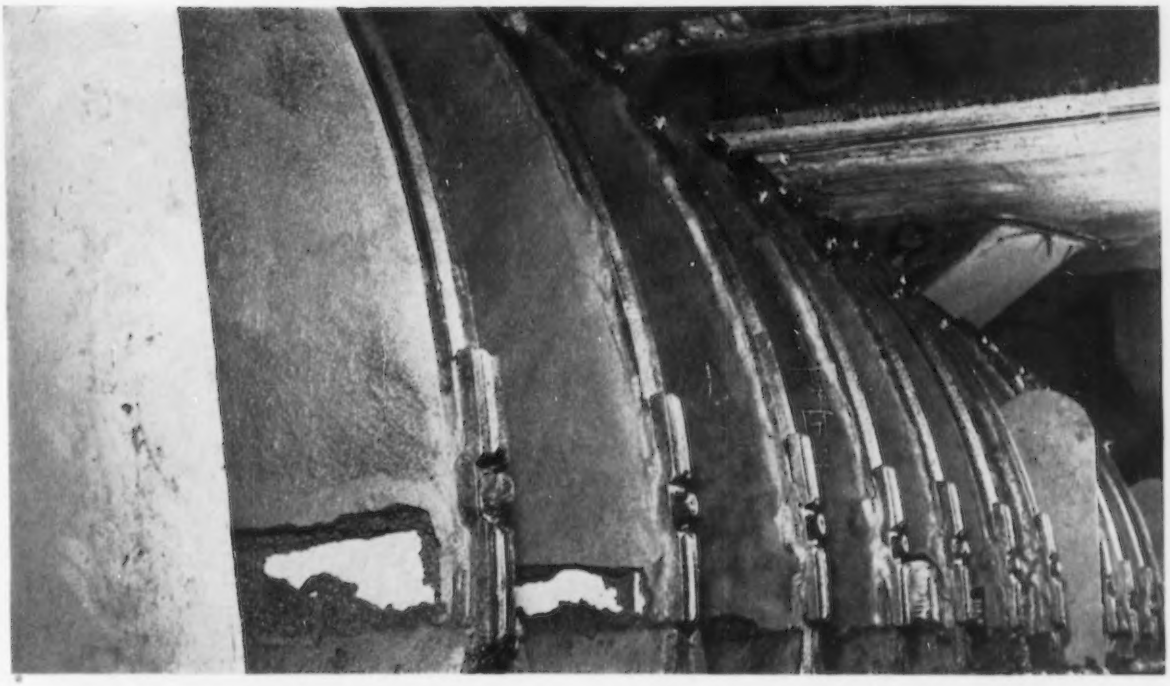
There's no question that dependability is a must in service like this. Minimum restriction of steam flow—plus smooth, positive and quick seating on backflow—*must* be provided for safe, steady boiler operation. And Crane stop-check valves can do it—*have* been doing it for years and years.

Before you specify any valve, be sure to look into the advanced designs and materials, the broad selectivity and service suitability of the great Crane line. You'll find everything you need in valves and fittings—built to the highest standards of quality. Get full information from your local Crane Representative, or write to address below.

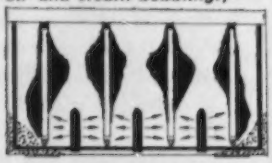
CRANE VALVES & FITTINGS

PIPE • KITCHENS • PLUMBING • HEATING

Since 1855—Crane Co., General Offices: Chicago 5, Ill. Branches and Wholesalers Serving All Areas



Function of "impeller" design is agitation thru stirring. Results: Cake scour and uneven formation; vacuum loss at thin sections near the periphery of disc. (Other methods included pipes for air and steam bubbling.)



This "rake oscillating agitation" design (from drum filters) is equipped with upright pieces of various shapes to increase agitation. The result: Cake scour and uneven formations due to direction of thrust.

The Eimco Agidisc method now used provides agitation straight-up between the discs, giving the many advantages listed in text at right.

EIMCO AGIDISC FILTERS HAVE EXCLUSIVE ADVANTAGES

Eimco Hy-Flow Agidisc Filters give you these important advantages:

1) Even cake distribution without segregation. **2)** Uniform thickness and dryness. **3)** Higher tonnage capacity per square foot of filter area. **4)** Dryer cake. **5)** Clean discharge. **6)** Longer media life. **7)** Lower maintenance costs.

After Eimco pioneered the agidisc filter, other manufacturers tried to match its performance by adding attachments to their existing filters.

Sketches at left readily show disadvantages of makeshift agitation.

The Eimco Agidisc is NOT a "patched up" version of other filter designs with doubtful operating merits. It is an integral unit. Scientific planning went into its distinctive design. Advantages were test-proven before it was marketed.

Confirmation that these filters are producing the advantages for which they were designed, is being received every day from Eimco Agidisc users.

THE EIMCO CORPORATION

Salt Lake City, Utah—U.S.A. • Export Offices: Eimco Bldg., 52 South St., New York City

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B-217

Crushing Iron Ore in South America with TELSMITH® Equipment

Telsmith 5′ x 12′ Heavy-Duty Scalper and 489S Gyrasphere Crusher.

Telsmith 25″ x 36″ Jaw Crusher and 36″x10′ Heavy-Duty Apron Feeder.

Telsmith 5′ x 12′ Heavy-Duty Finishing Screen.

• Acerias Paz de Rio, S. A.—the only steel mill in Columbia—owns this Telsmith iron ore crushing-screening plant. From the mines at Paz de Rio, the crushed ore is transported 30 miles to the steel mill at Belencito, 180 miles from Bogata. This Telsmith designed and completely Telsmith equipped plant crushes and screens 2500 tons per 8-hour day, of colitic limestone containing 48% iron. Get descriptive Bulletin 266.

50th ANNIVERSARY TELSMITH 1906-1956

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SMITH ENGINEERING WORKS

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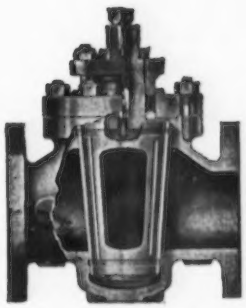
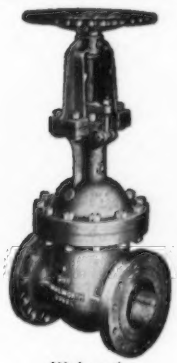
Representatives in Principal Cities in All Parts of the World • **Cable Address: Sengworks, Milwaukee**

● VALVES

● PIPE FITTINGS



Walworth
Lubricated Plug Valve



Walworth
Steel Gate Valve

Walworth
Iron Body Gate Valve

Walworth
"500 Brinell" Bronze Globe Valve

Walworth
Iron Body Saddle Gate Valve

Walworth
Cast Steel Flanged Fittings

Walworth manufactures a *complete line* of valves and pipe fittings: all made to the highest standards of quality, both as to dimensional accuracy and metallurgical properties. In design, construction, and performance, Walworth products reflect more than a century of experience in the manufacture of quality valves and fittings.

Your Walworth distributor will give you full information on the *complete line* of Walworth steel, iron, and bronze, and special alloy valves and pipe fittings; also Walworth Lubricated Plug Valves, and Walseal* valves, fittings and flanges. Ask for this information today.

*Patented—Reg. U. S. Pat. Off.

WALWORTH

valves and fittings

60 EAST 42nd STREET, NEW YORK 17, N. Y.

More Profitable Goldbricking at Benguet with Unique Slime Flotation Process

1—The combined 3000 tpd Benguet-Balatoc mill in the rugged grandeur of the Baguio gold-mining field.

2—Ball mills and bowl classifiers in the cyanide circuit.

3—Tray thickeners in cyanide circuit showing scummy froth associated with the primary slime of the ore.

1—

AMERICAN CYANAMID COMPANY

MINERAL DRESSING DEPARTMENT

30 ROCKEFELLER PLAZA, NEW YORK 20, N. Y.

At the 3,000 ton per-day Benguet-Balatoc mill of Benguet Consolidated Inc. in the Philippines, primary slimes resulting from gouge material in the vein system amount to 13% of the tonnage milled. Extremely fine and gelatinous, these slimes are difficult to thicken and almost impossible to filter because they form a very thin, impervious filter cake.

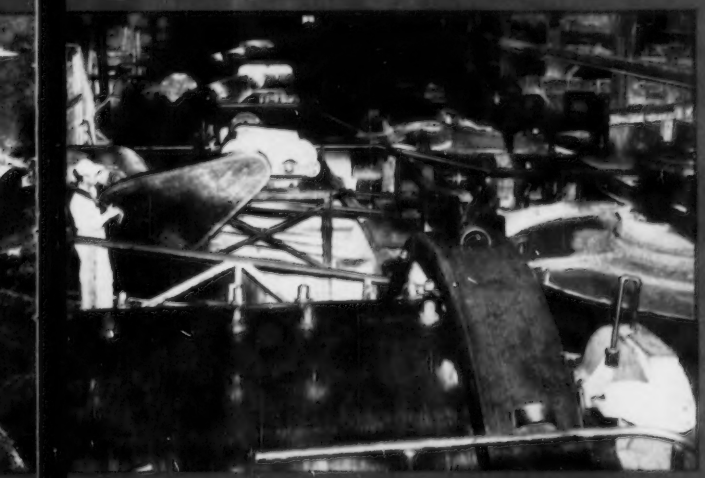
In spite of these extraordinary difficulties, Benguet's novel procedures now recover 79% of the gold in these slimes. After sand-slime separation in spiral classifiers, the slime is passed through a 24" DorrClone at the rate of about 250 tons per day. The underflow goes to cyanidation with the sands, and the overflow to flotation.

Feed to flotation contains about 2.25% of the total values in the original ore and averages 12% to 14% solids. Reagents used include AERO® Xanthate 301 at 0.033 lb. per ton and AERO® Xanthate 350 at 0.046 lb. per ton, with pine oil and soda ash, to scalp out a concentrate running over $9.00 per ton. Flotation concentrates are fed to the cyanidation circuit for leaching with AERO® Brand Cyanide.

Prior to use of DorrClones in the slime circuit, 5.5% of the total tonnage milled was treated by flotation. With the addition of the 24" DorrClone, approximately 8.5% of the total tonnage milled now goes to flotation.

The present method improves precipitation, filtration of final residues is easier and soluble loss is reduced. Fewer pumps are required. There is a marked effect on settling in both primary and secondary thickener circuits, allowing two 50-foot balanced tray thickeners to be withdrawn from the cyanidation circuit. And flotation reagent consumption is slightly less.

Important to the Philippine economy, the post-war resurgence of the Benguet operation has been remarkable. Two independent mills at Balatoc and Benguet were almost completely destroyed during the invasion and liberation of the Philippines in 1941-45. Ingeniously and painstakingly the



2—

3—

mill was rebuilt at Balatoc with salvaged bits and pieces and operations were resumed until new equipment arrived. The Balatoc mill handles ore from both mines, with Benguet ore travelling through a 13,000-foot tunnel.

Cyanamid engineers have been privileged to work with the Benguet staff for many years. Cyanamid has supplied Benguet and Balatoc with its products for over 25 years. A Cyanamid engineer will be glad to share with you his sound operating and metallurgical knowledge. A letter or phone call will bring you prompt service.

CYANAMID

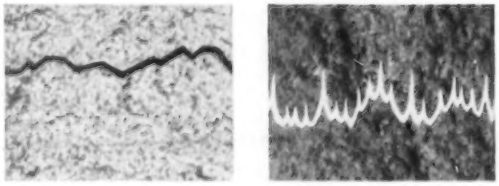
NOW . . . step up dragline output . . . WITH ALL-NEW BUCYRUS-ERIE BUCKETS

You swing more payload, less deadweight every hour with the new Bucyrus-Erie dragline buckets. A combination of an all-new, lightweight yet strong design and a new long-wearing material makes it possible.

The new material is BECOLOY, a special steel alloy with a tough, fibrous structure ideally suited to dragline bucket service. The new design features a "slicing-action" lip that penetrates material quickly, and a tapered basket shaped to load full and fast. Proper flaring and balance minimize spilling and bobbing. The inside design is smooth and the arch is extra high for fast, clean dumping.

Your Bucyrus-Erie distributor can help you select the right size and model of these new buckets to fit your job, to bring you better output performance than ever before. Three types are available—light, medium and heavy-duty —with either solid or perforated baskets.

BECOLOY . . . **exclusive new alloy for Bucyrus-Erie dragline buckets.**

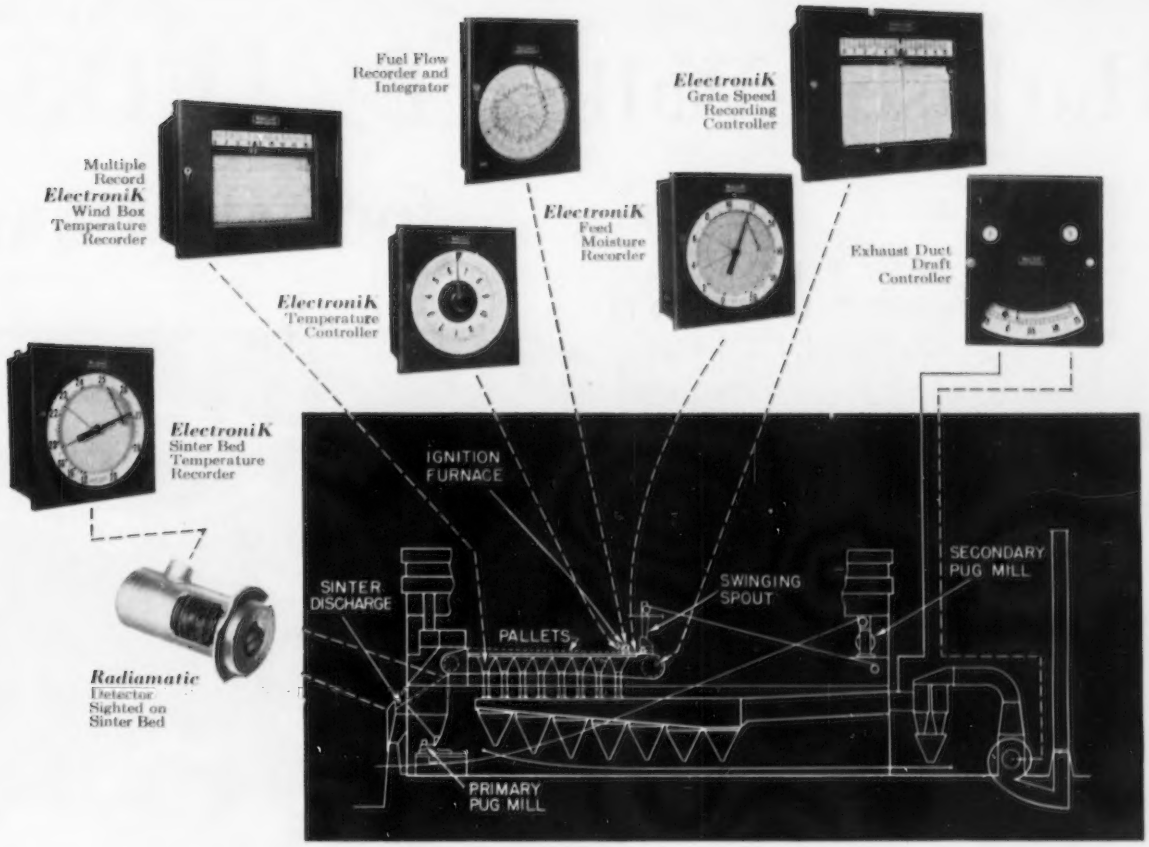


The BECOLOY fracture surface at right shows the tough, fibrous structure that imparts high strength to this alloy. Ordinary steel fracture surface, at left, has a coarse, crystalline pattern.

19R56

BUCYRUS ERIE

SOUTH MILWAUKEE, WISCONSIN



Complete instrumentation for sintering processes—*available from Honeywell*

THE COMPLEX sintering machines used in modern ore benefication processes demand accurate, automatic control of ore critical variables in order to function at peak efficiency. For the varied requirements of such equipment, Honeywell produces a comprehensive line of instrumentation.

A typical measurement and control system for a sintering machine is shown in the diagram above. From feed of prepared materials to discharge of sinter, this instrumentation covers every phase of process operation.

Ignition Furnace Fuel Control . . . *ElectroniK* Temperature Controller, with appropriate system for regulating either gas or liquid fuels . . . plus Brown Flow Meter for recording and integrating fuel flow.

Grate Speed . . . an *ElectroniK* instrument, working with an electric tachometer element, measures and controls speed by regulating the grate motor or variable speed coupling.

Wind Box Temperatures . . . a multi-point *ElectroniK* instrument records individual temperatures . . . or individual temperature indications, correlated with wind box suction.

Moisture Content and Temperature of Feed . . . can be recorded or controlled by specially calibrated *ElectroniK* instruments.

Sinter Bed Temperatures . . . *Radiamatic* element sighted on bed surface leaving ignition furnace is connected to an *ElectroniK* temperature recorder showing carbon and moisture fluctuation.

Draft Control . . . a Brown Pressure Controller or Flow Controller regulates the exhaust fan to maintain constant draft or air volume.

Your local Honeywell sales engineer will be glad to discuss instrumentation for your specific benefication process. Call him today . . . he's as near as your phone.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, Wayne and Windrim Avenues, Philadelphia 44, Pa.—in Canada, Toronto 17, Ontario.

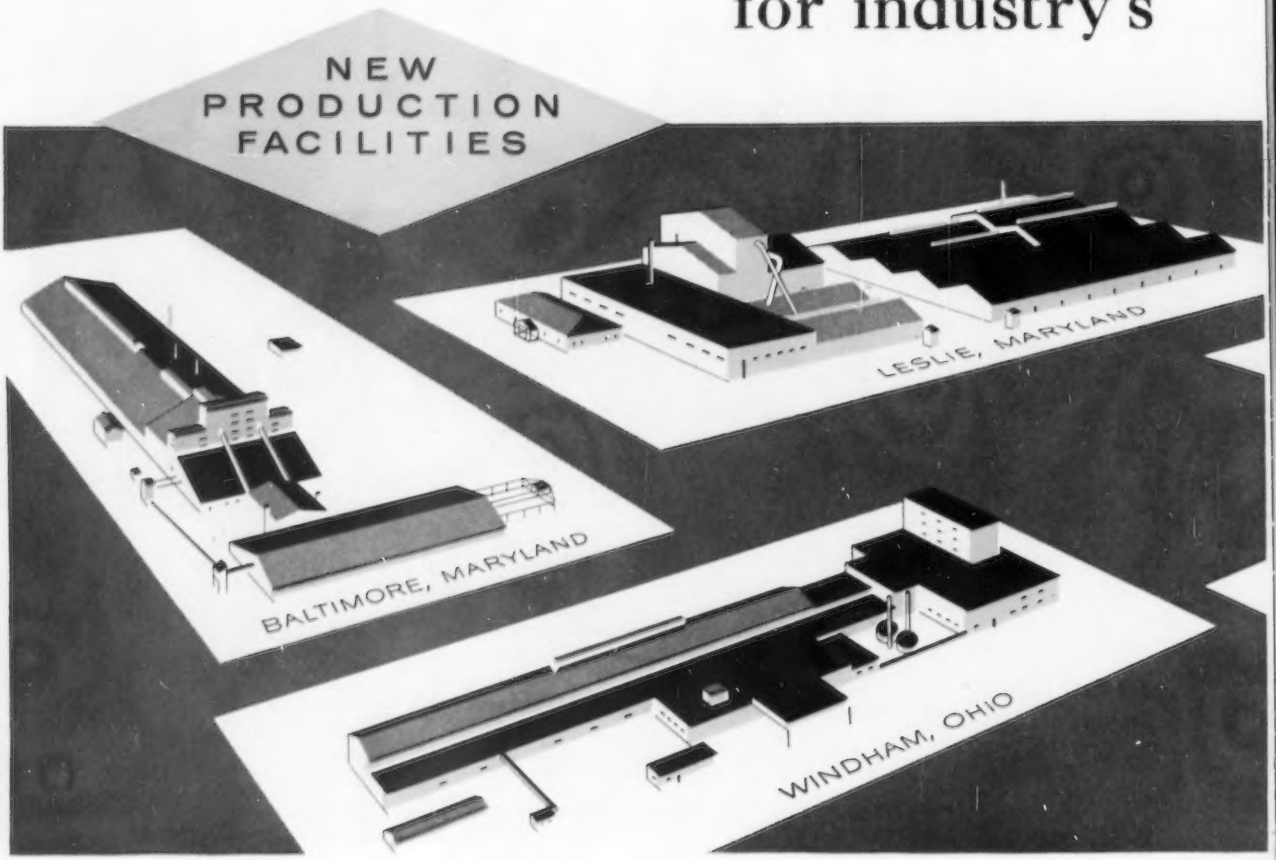
● **REFERENCE DATA: Write for Composite Catalog No. 5002 for a condensed listing of all Brown instruments.**

MINNEAPOLIS **Honeywell**

BROWN INSTRUMENTS

First in Controls

Harbison-Walker BUILDS for industry's NEW PRODUCTION FACILITIES

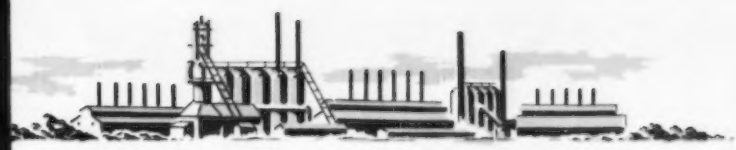


RAPID GROWTH and evolutionary changes in substantially all industrial processes necessitate similar progress in the production of refractories. In order to meet industry's increasing demands and in anticipation of even greater and more exacting future requirements, Harbison-Walker has conducted a continuous program of expansion and modernization. Consistent with this policy, a number of new plants have been built, some of which are here illustrated. Other new plants are under construction at Ludington, Michigan and Hammond, Indiana, the former for the production of dead-burned magnesia of unusually high purity, and the latter for the manufacture of basic brick and other basic refractories. Both will be provided with docks for water shipment. These two new additions provide Harbison-Walker with a total of 36 plants in the United States, Canada, Peru and Mexico. The Company operates scores of mines and quarries located in these areas.

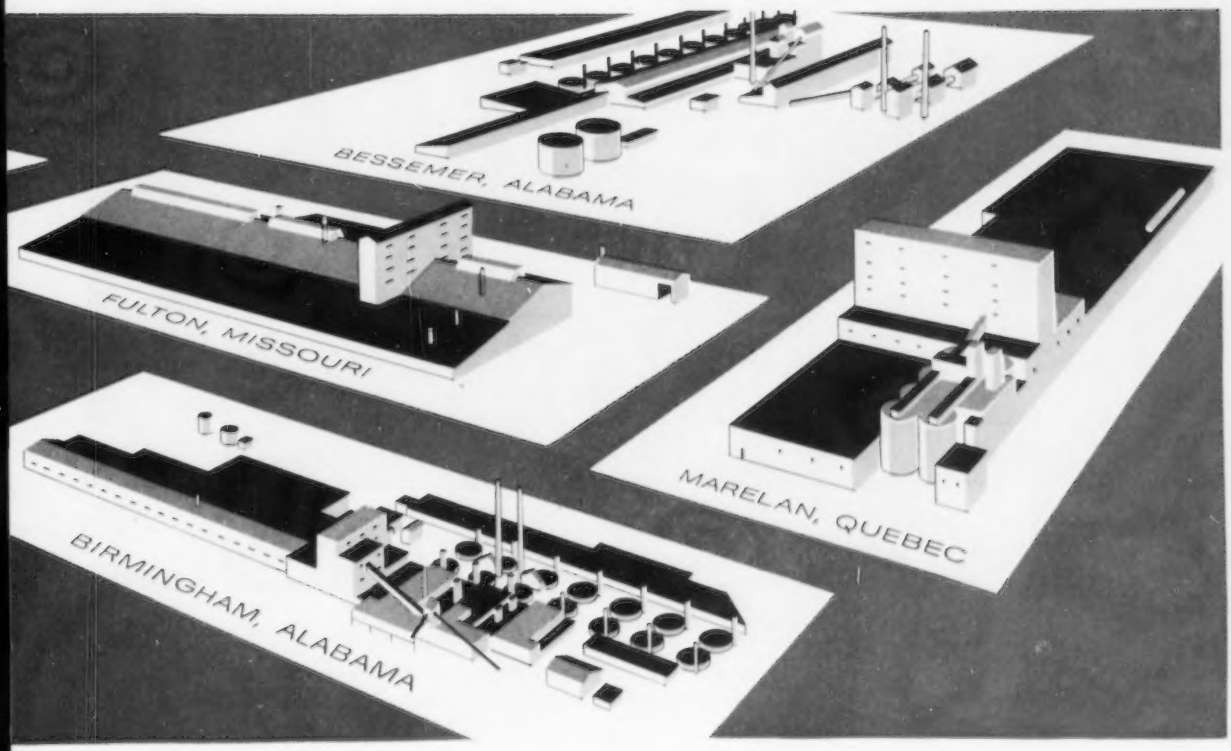
In addition, the production capacities of other plants have been materially increased with the benefit of the most modern facilities. These widely distributed plants are located at Warm Springs, California; Athens, Texas; East Chicago, Indiana; Olive Hill, Kentucky; Portsmouth, Ohio; and Clearfield, Pennsylvania. Further expansion will follow as required.

Coupled with this large expansion is an accelerated research program. A new greatly enlarged central research laboratory will be built in Pittsburgh and the present laboratory then will be converted entirely to Quality Control. Among the main research objectives is the development of new types and classes of refractories needed for new processes and for withstanding more severe service conditions. Another important research accomplishment is the continual enhancement of properties of conventional refractories. Laboratory research is closely co-ordinated with extensive studies of the performance of various refractories in the many kinds of metallurgical and other industrial furnaces.

Harbison-Walker has consistently kept pace with



future refractories needs



industry by the development and adoption of new and improved manufacturing methods. The most modern and precise production processes are used. The present Quality Control Program exceeds anything previously employed in the refractories industry.

These Harbison-Walker progressive accomplishments contribute greatly to better refractory practice for industry. To the producers of iron and steel, aluminum, copper and other non-ferrous metals, cement, glass, chemicals and steam power, better refractories mean longer furnace life, less maintenance and reduced operating costs.

HARBISON-WALKER SERVES ALL INDUSTRIES WITH ALL TYPES AND CLASSES OF REFRACTORIES

ALUMINA-SILICA BRICK—Super-duty, high duty and all other classes of fireclay brick.

HIGH-ALUMINA BRICK—All classes 50% to 99% Al_2O_3 inclusive.

SILICA BRICK—Super-duty and conventional.

BASIC BRICK—Metalkase, periclase, magnesite, chrome, forsterite, chrome-magnesite and magnesite-chrome.

INSULATING REFRACTORIES • PLASTIC AND CASTABLE REFRACTORIES • HIGH TEMPERATURE BONDING MORTARS • REFRACTORY RAMMING MIXTURES • GRAIN AND LUMP SIZE REFRACTORY MATERIALS

The World's Most Complete Refractories Service

HARBISON-WALKER REFRACTORIES CO.

AND SUBSIDIARIES

GENERAL OFFICES: PITTSBURGH 22, PENNSYLVANIA

OFFICES AND WAREHOUSES IN PRINCIPAL CITIES

Courtesy: Link-Belt Company

Ray-Man Belt "TRAINS" Naturally and Hauls Full Loads

Engineered features of Ray-Man Conveyor Belt give it the easy troughability and wear resistance to handle the heaviest loads. Special cushioned strength members and strong, yet resilient synthetic outer plies provide compensation to give this belt unusual flexibility. It permits full loads even where thick, narrow belts are used, or where belts must round small pulleys. Ray-Man Conveyor Belt requires no breaker strip . . . yet it resists gouging, tearing and ripping from large, abrasive lumps better than other constructions. It holds fasteners under the most severe operating conditions.

Ray-Man is mildew-proof and moisture resistant. Like other Manhattan heavy duty conveyor belts, it features R/M's exclusive "XDC" Cover which gives it protection against wear, tear, cuts and abrasion never before possible. We say Ray-Man Conveyor Belt gives you "More Use per Dollar" because it does a better job . . . and it *lasts longer*.

Let an R/M representative show you the advantages of Ray-Man as well as other R/M feature conveyor belts . . . extra-cushioned Homocord, for unusually abusive shock loading . . . R/M Tension-Master for extra long lifts and high tensions. For the best conveyor belt to meet your job requirements . . . for "More Use per Dollar" . . . contact an R/M representative today.

RM-602

MANHATTAN RUBBER DIVISION—PASSAIC, NEW JERSEY

RAYBESTOS-MANHATTAN, INC.

Other R/M products include: Industrial Rubber • Fan Belts • Radiator Hose • Brake Linings • Brake Blocks • Clutch Facings • Asbestos Textiles • Packings • Engineered Plastic, and Sintered Metal Products • Laundry Pads and Covers • Bowling Balls

from Asbestos to Zinc...

ASBESTOS	IRON ORE	SILVER
ANTIMONY	LEAD	SLAG
CEMENT	LIMESTONE	TACONITE
CHROMIUM	MANGANESE	TIN
COPPER	MOLYBDENUM	TITANIUM
DOLOMITE	NICKEL	TUNGSTEN
FELDSPAR	NITRATE	URANIUM
GOLD	POTASH	VANADIUM
GRAVEL	REFRACTORIES	ZINC

SYMONS® CONE CRUSHERS

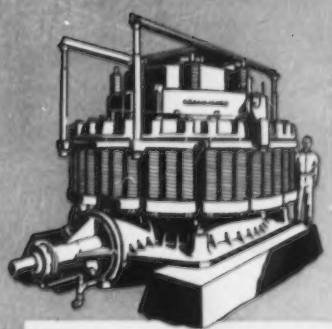
are the leading choice for large volume production of finely crushed material at low cost

In all of the great ore and industrial mineral operations throughout the world, ranging from Asbestos on through Zinc, Symons Cone Crushers have consistently aided man by making possible the efficient reduction of these materials to meet growing demands.

Continual repeat orders for Symons Cones from the world's leading ore and mineral producers conclusively establish this fact.

Whenever *you* are confronted with high capacity fine reduction crushing problems, it will pay you to investigate the advantages of Symons Cone Crushers . . . *the machines that revolutionized crushing practice.*

Nordberg Mfg. Co., Milwaukee, Wis.



• SYMONS Cone Crushers are built in Standard, Short Head, and Intermediate types, with crushing heads from 22 inches to 7 feet in diameter—in capacities from 6 to over 900 tons per hour.

SYMONS . . . A REGISTERED NORDBERG TRADEMARK KNOWN THROUGHOUT THE WORLD

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Symons Gyratory Crushers

Grinding Mills

Mine Hoists

Vibrating Grizzlies

Diesel Engines

NORDBERG MACHINERY

NORDBERG

SYMONS "SCREENS" NORDBERG

MACHINERY FOR PROCESSING ORES and INDUSTRIAL MINERALS

NEW YORK • SAN FRANCISCO • DULUTH • WASHINGTON
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Nordberg

GRINDING

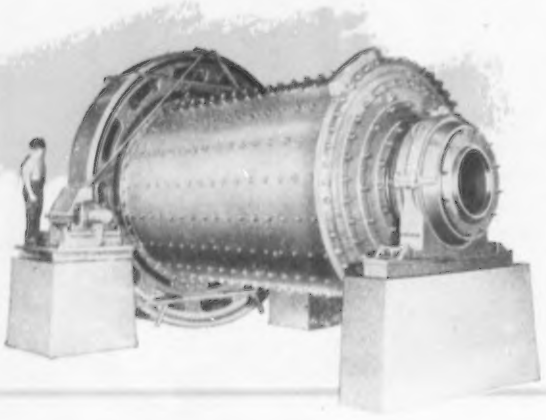
. . . built to meet the exacting requirements of the MINING INDUSTRY

NORDBERG MACHINERY is the result of specialized engineering skills aided by unsurpassed manufacturing facilities. For over half a century Nordberg has produced heavy machinery for the mining industry, which has become well known all over the world for its advanced engineering, excellent construction, high efficiency and dependable service.

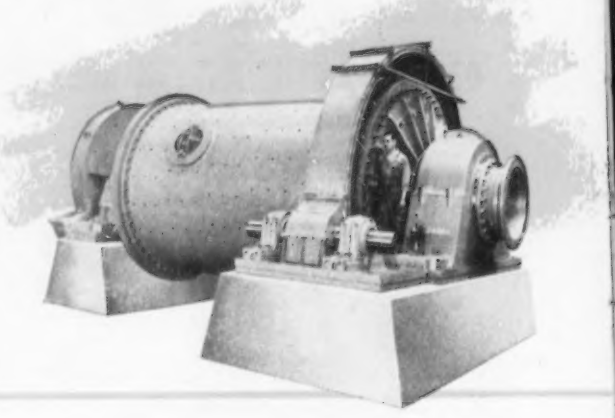
Included in this broad line of heavy machinery is the complete line of Nordberg Grinding Mills, designed and built to meet the most exacting requirements of the mining industry . . . for wet or dry grinding of metallic and non-metallic minerals, and in other processes where friable material must be comminuted to fine sizes.

Nordberg Grinding Mills are manufactured in sizes ranging from 6 to 13 feet in diameter and up to 50 feet in length. Types include Ball, Pebble, Rod, Tube and Compartment Mills.
Write for further information.

NORDBERG MFG. CO., Milwaukee, Wisconsin



Typical Nordberg dry grinding Rod Mill, measuring 10'-6" in diameter by 16' in length, for ore processing service. Mills of this type are in wide use in the mining industry, delivering maximum output at lowest possible cost.



• View showing discharge end of Nordberg 10'-8" x 17' wet grinding Ball Mill with Scoop Feeder. Whether wet or dry process, open or closed circuit operation, there is a Nordberg Grinding Mill built for the job.

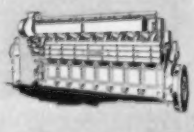
SYMONS GYRATORY CRUSHERS

SYMONS CONE CRUSHERS

NORDBERG KILNS AND COOLERS

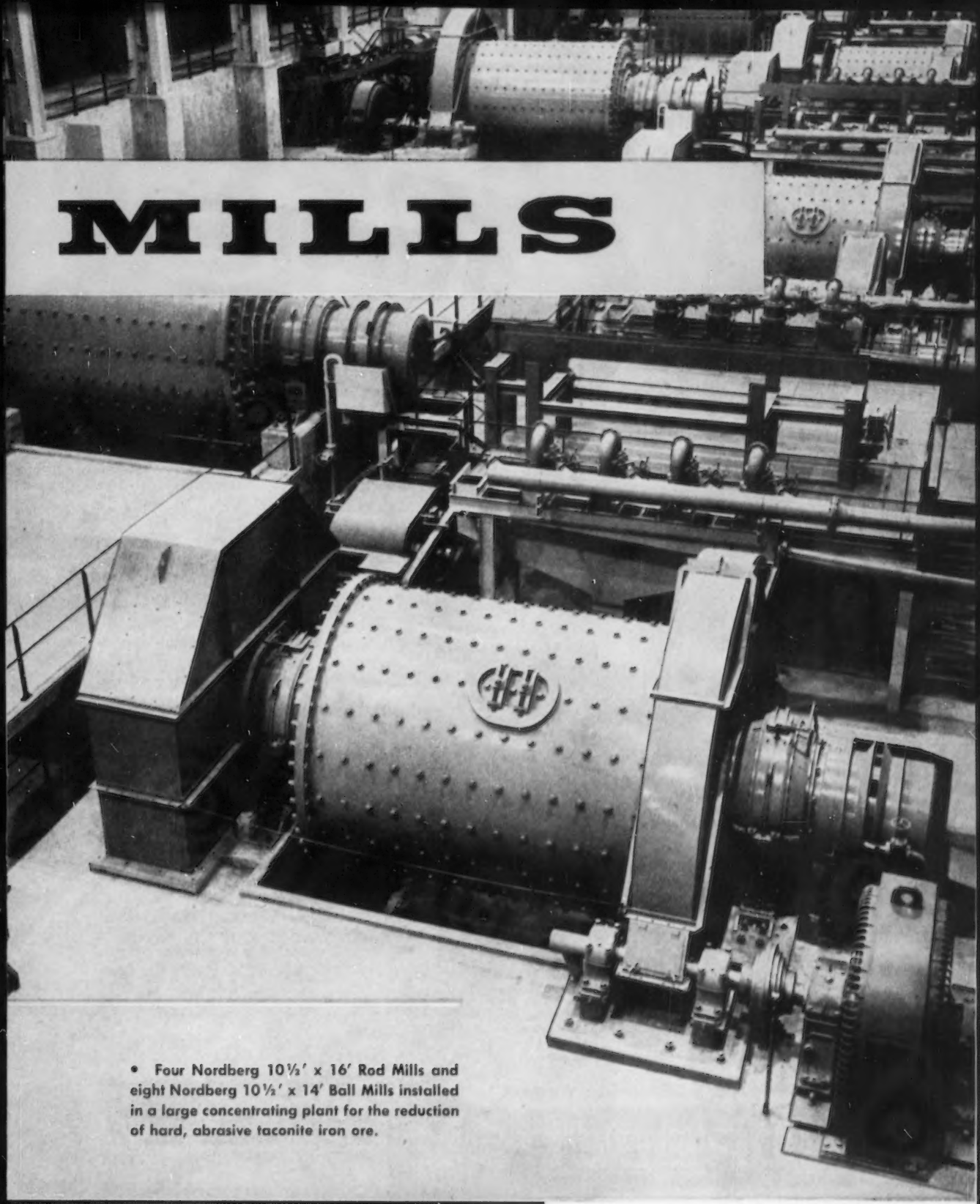
NORDBERG MINE HOISTS

SYMONS VIBRATING GRIZZLIES AND SCREENS



NORDBERG DIESEL • DUAFUEL® and SPARK-IGNITION GAS ENGINES

MILLS



• Four Nordberg 10½′ x 16′ Rod Mills and eight Nordberg 10½′ x 14′ Ball Mills installed in a large concentrating plant for the reduction of hard, abrasive taconite iron ore.

NORDBERG

MACHINERY FOR PROCESSING ORES and INDUSTRIAL MINERALS

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SYMONS...

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GM-156

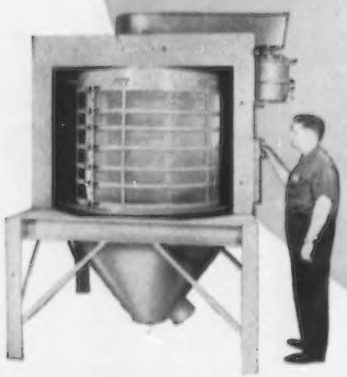
From Scalping to Fine Screening . . .

SYMONS VIBRATING BAR GRIZZLIES for heavy duty large capacity primary scalping where clear spacings of 1½" and larger are permissible. Up to 500 tph, handling feeds ranging to 30" and larger.

SYMONS SCREENS

meet production demands for the MINING INDUSTRY

SYMONS VIBRATING ROD GRIZZLIES for heavy duty big capacity scalping. Up to 500 tph for feeds up to 12". Ideal for scalping operations requiring relatively coarse separations in the range between 1" to 4".



SYMONS ROD DECK SCREENS employ a highly efficient screen deck utilizing individual replaceable steel rods. Features low screening cost — big capacity — long life — ideal for moist and sticky materials.

SYMONS V-SCREENS give unequalled high capacity for sharp, single cut, wet or dry separations, especially in the finer sizes. This high capacity, sharp separation is the result of centrifugal force—an exclusive Symons V-Screen feature.

Symons Vibrating Grizzlies and Screens are playing an increasingly important role in the efficient processing required in producing big tonnages of ores and minerals. From heavy duty scalping operations on through fine screening, more and more leading producers are depending upon Symons screens to do a better separation job at lower cost per ton.

These quality grizzlies and screens have gained an enviable reputation for dependability and efficiency throughout the mining industry . . . and are backed by the same high standards of accuracy, workmanship and progressive engineering that is used in the manufacture of *all* Nordberg Machinery.

Mail the coupon for further details.

SYMONS . . .
A REGISTERED NORDBERG TRADEMARK KNOWN THROUGHOUT THE WORLD.

NORDBERG MFG. CO., Milwaukee, Wisconsin

NORDBERG MACHINERY **NORDBERG** GRIZZLIES SYMONS SCREENS NORDBERG

MACHINERY FOR PROCESSING ORES and INDUSTRIAL MINERALS
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Send literature on SYMONS: ☐ Bar Grizzlies; ☐ Rod Grizzlies; ☐ Rod Deck Screens; ☐ V-Screens

Name_____

Company_____

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City_____ Zone____ State_____

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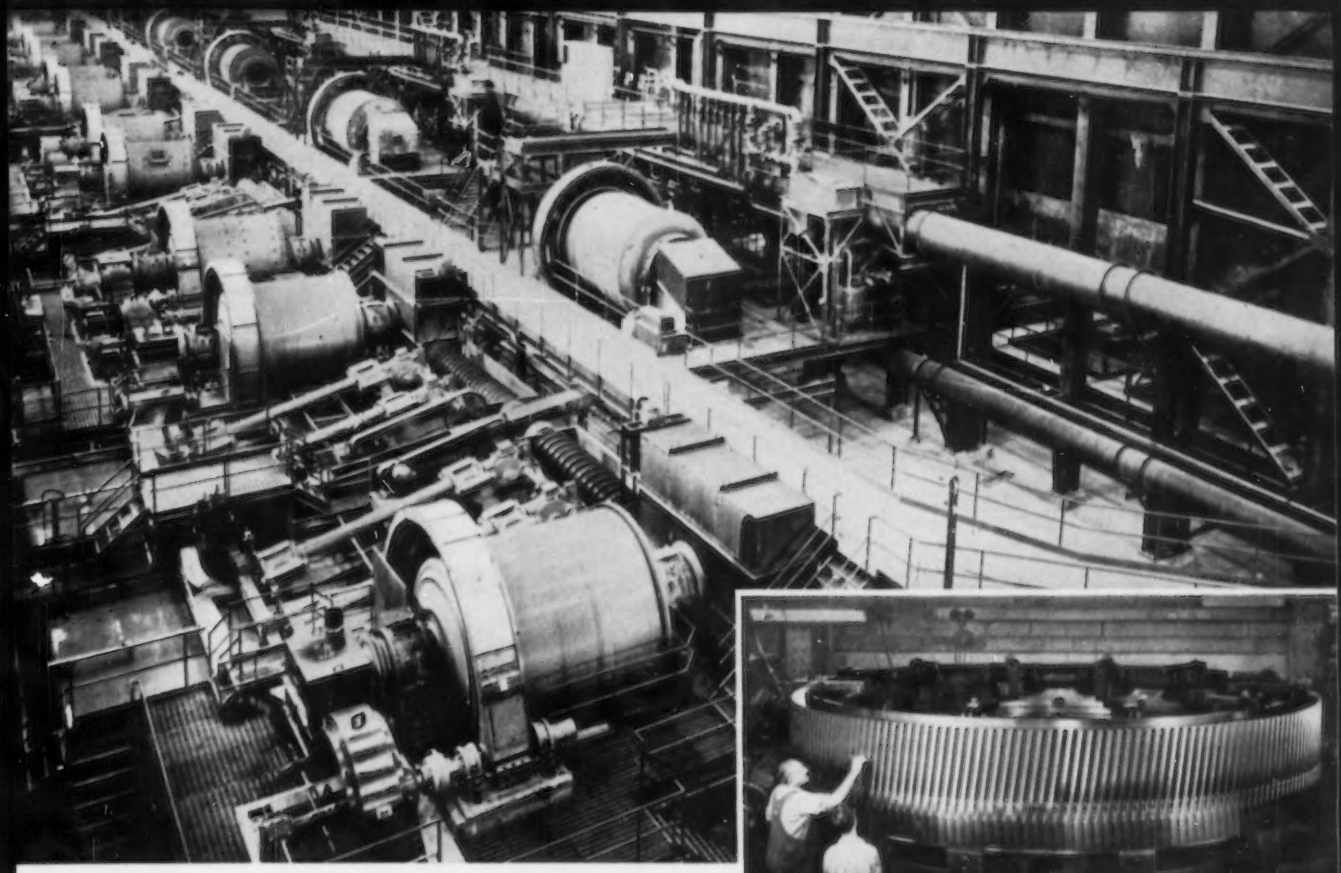
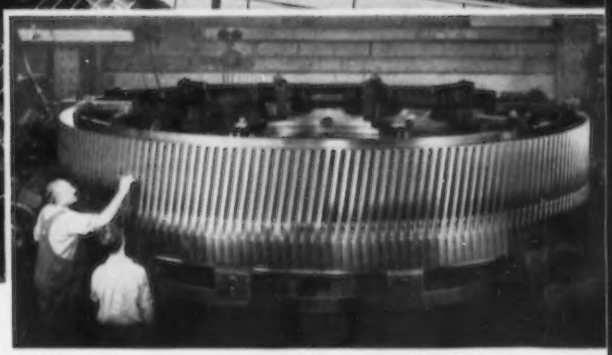




Why Falk Gears cost less per year of service

Experienced mill and kiln operators and engineers know that annual gear expense is determined by many factors besides the initial cost of the gears themselves. Among these factors are: tonnage handled, efficiency, and effect of gear operation on driving and driven machinery, shutdowns caused by gear failures or pinion replacements—and the service life of the gears.

By any, or all, of these standards, Falk Helical Gears are the most economical gears you can buy! They are *correctly designed, engineered and built* for highest accuracy, thanks to Falk's long and unmatched experience. All gears are *precision-hobbed* on machines designed and built by Falk. Each gear has a serial number; its pedigree is established during its course through the several shops and the many operations and tests to which it is subjected.

Repeated tests have proved that Falk Helical Gears have an efficiency of 98½% or greater—the highest obtainable!

These gears, with the smooth operation of their extra-capacity teeth, provide maximum resistance to abrasive wear—hence longer life, not only of the gears, but of driving and driven machinery. This means multiple savings for you.

Falk is the country's largest supplier of precision gearing...and has unsurpassed facilities to fill all your gear requirements.

Contact any Falk Representative—also, write for
Engineering Report 6170, "Advantages of Helical Gearing"

THE FALK CORPORATION, 3001 W. CANAL ST., MILWAUKEE 1, WIS.

FALK HOBBED GEARS FOR IMPORTANT CEMENT MILLS

The 2000 hp helical gear in the small photograph above is one of six destined to drive important cement mills, probably the largest mills built to date.

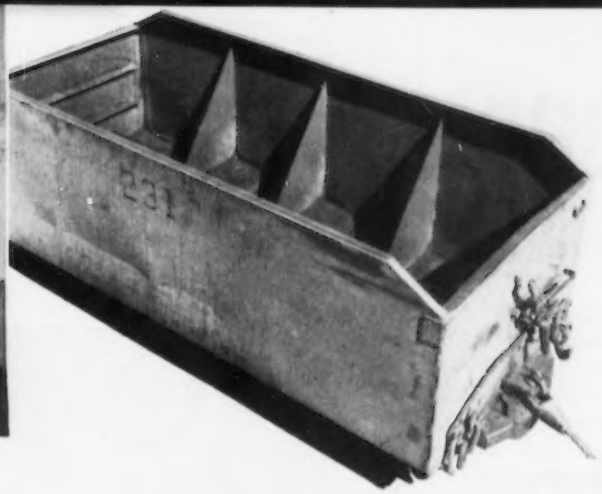
All Falk Helical Gears, both single and herringbone, are precision-hobbed on special Falk-built hobbers of highest accuracy. Falk gear hobbers have incorporated in the design of the gear train a mechanism which is extremely effective in reducing tooth-spacing errors to negligible values. The accuracy inherent in the machines has the salutary effect of insuring perfect load division between the several teeth that are simultaneously in contact in helical gears.

Finish hobbing is done in a room where the temperature is controlled within a variation of two degrees. This is a precaution against possible dimensional changes of the gear during the all-important finishing operation—changes which might affect ultimate accuracy.

FALK
...a good name in industry

19-year-old

Be sure to visit
United States Steel Booth
at the Mining Show
Los Angeles, Calif.
Oct. 1st. to 4th.



COR-TEN cars at Columbia Mine still "too young to retire"

Two hundred mine cars made of USS COR-TEN Steel have been in continuous service at Columbia Coal Mine in Utah for 19 years. Had they been built of steels ordinarily used, they would have been on the scrap heap long ago. Yet, the cars are still in good condition, and have a lot of life left in them. James Cassano, mine superintendent, says, "As far as the *steel* in these cars is concerned, some of them might hold up for another 20 years."

The mine has a total of 326 coal cars —all made of USS COR-TEN Steel. The cars are 5½ feet wide, 13 feet long, and 42 inches high. The sides of each car are fabricated from $\frac{3}{16}$-inch COR-TEN plate; the ends and bottom are of ¼-inch COR-TEN plate. Average car capacity is six tons of coal.

In 1955, the mine and its 285 miners produced 581,554 tons of high volatile bituminous coking coal, subjecting the cars to constant rigorous service. Corrosive conditions in the mine are extremely bad, and because of the steep grades the cars travel, in and out of the mine, collisions are not infrequent. Thus, the COR-TEN Steel in the cars has had to cope with two destructive forces.

But high strength plus high resistance to corrosion are USS COR-TEN's big advantages. It has 4 to 6 times as much resistance to atmospheric corrosion as ordinary structural steel, 2 to 3 times that of copper steel.

All three USS High Strength Steels —COR-TEN, MAN-TEN, and TRI-TEN— enable mining equipment to give far more service per dollar of cost than carbon steel. They have a 50% higher yield point, and, in varying degrees, offer greater resistance to wear, fatigue, abrasion and impact. These USS High Strength Steels are used to replace carbon steel in the vital parts of mine cars, dozers, shovels, drag lines and other such equipment to increase service life without increasing dead weight. Where the use of thinner sections is feasible, they can frequently (1) reduce equipment weight without reducing its strength, or (2) increase the size and capacity of equipment without increasing the total weight or the power needed to move it.

For more complete information, write United States Steel, Room 2801, 525 William Penn Place, Pittsburgh 30, Pennsylvania.

See "THE UNITED STATES STEEL HOUR"—Televised alternate weeks—Consult your newspaper for time and station.

UNITED STATES STEEL CORPORATION, PITTSBURGH • AMERICAN STEEL & WIRE DIVISION, CLEVELAND • COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
NATIONAL TUBE DIVISION, PITTSBURGH • TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA. • UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS
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USS HIGH STRENGTH STEELS

USS MAN-TEN • USS COR-TEN • USS TRI-TEN

6-2469

UNITED STATES STEEL

JONES DRIVES SOLVE SPACE

Dual-Series Drive Arrangement Operates 2,800 TPH

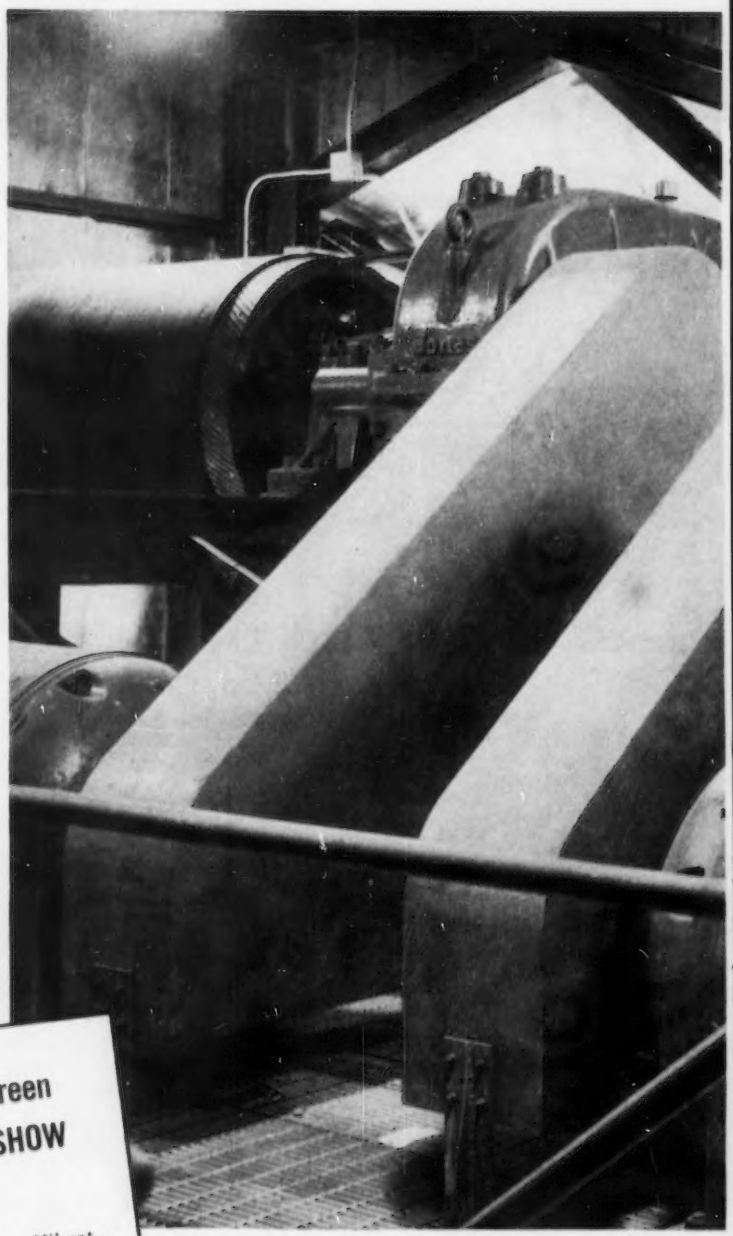
A dual-series drive arrangement was the answer to a difficult space limitation problem at a copper mine in Northern Michigan. Versatile Jones speed reducers made it possible to mount both drives on the right side of the head shaft. Otherwise, it would have been necessary to construct an overhanging structure to support and house a drive unit on the left side.

This particular multiple drive takes advantage of the extra ruggedness built into equipment from the Jones Machinery Division of Hewitt-Robins. The low-speed (output) shaft of the speed reducer adjacent to the conveyor head shaft transmits the *full torque* required to drive the conveyor.

The speed reducers are standard Jones 405 DH double reduction herringbone types with ratios of 15.3 to 1. They operate a 338-foot heavy-duty belt conveyor at 2,800 tons per hour on an incline of 18°18' for a vertical lift of 106 feet.

Such special-purpose combinations of standard drive equipment to meet specific industrial requirements have long been the particular province of the Jones Machinery Division of Hewitt-Robins. Suiting the equipment to the need requires not only a broad background of engineering experience, but also a wide range of versatile, reliable power transmission products. Jones Machinery Division offers both the techniques and the equipment.

For information about Jones power transmission equipment, write to Hewitt-Robins, Stamford, Connecticut.



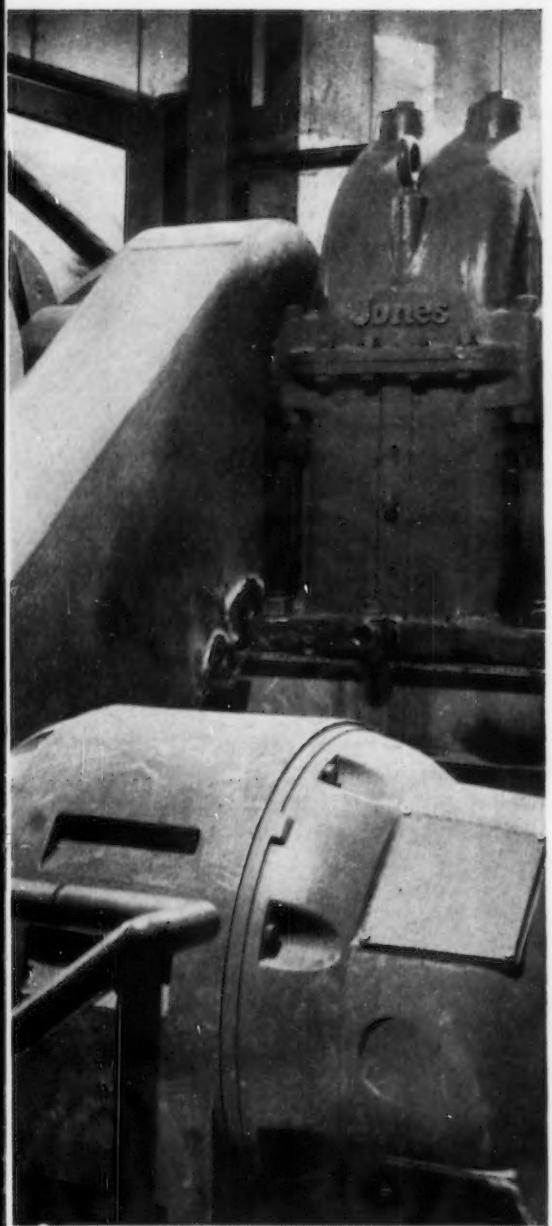
Don't miss the 6' x 24' Hi-G Screen
BOOTH #200 METAL MINING SHOW
Los Angeles, Oct. 1-4

Also learn about our other industrial products: Vibrating screens and conveyors; Belt conveyors and belting; Industrial hose; "Jones" power transmission equipment; Design, manufacture, engineering and erection of complete bulk materials handling systems.

HEWITT
STAMFORD,

PROBLEM

Belt Conveyor



-ROBINS

CONNECTICUT

HEWITT-ROBINS EQUIPMENT FOR THE METAL MINING INDUSTRY

BELT CONVEYOR SYSTEMS. Complete engineered systems from face through preparation plant . . . or individual units such as shuttle conveyors, underground haulage conveyors and slope conveyors.

VIBRATING SCREENS. A large variety of screens and dewaterizers for coal mining operations. Revolutionary new hi-G for greater capacity with less power; Gyrex positive stroke 4-bearing; Eliptex horizontal, flat-operating; Vibrex full-floating, unbalanced pulley-type; Eliptex Dewaterizers with specially designed Eliptex screen with micron-size opening stainless steel flat rod deck.

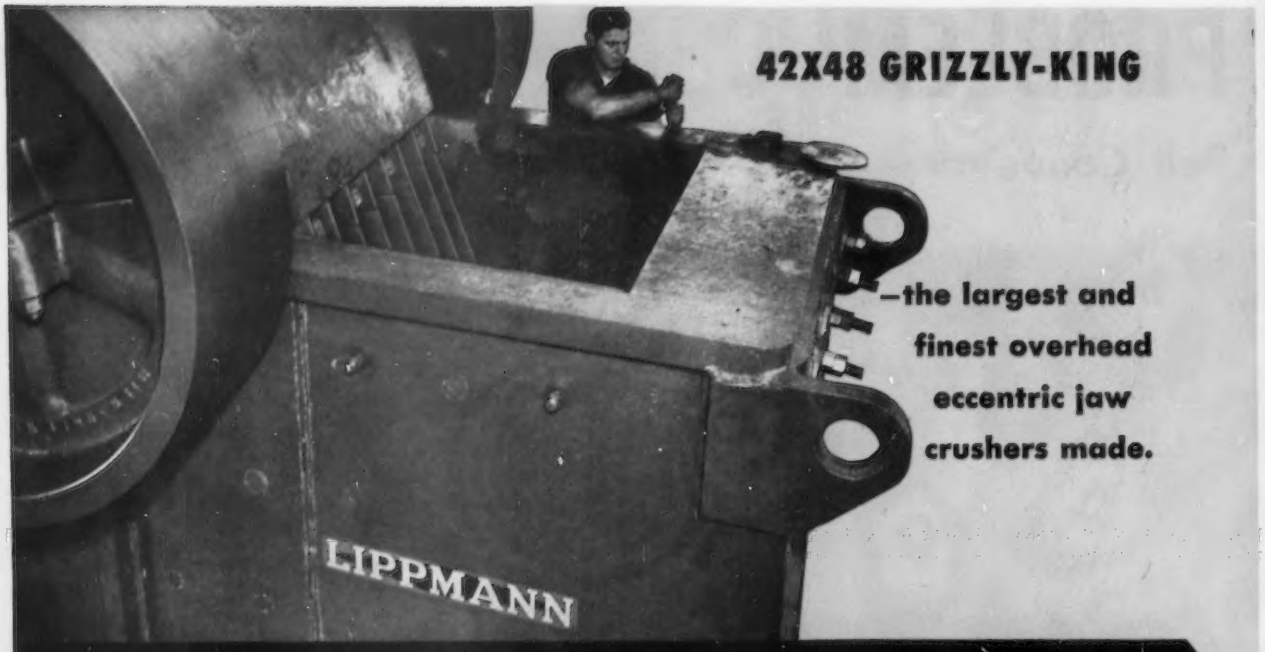
CAR SHAKEOUTS. Both Heavy-Duty and General-Service units for unloading all sorts of materials from hopper cars faster, more efficiently and more economically.

HOSE. Industrial hose in hundreds of types for thousands of purposes to carry air, water, steam, acid, petroleum products—anything that will flow.

SCREEN CLOTH. Wire cloth in a variety of sizes, weaves and materials for virtually every sizing, separating or screening operation.

CONVEYOR BELTING. Wide variety of belting for general-purpose or special applications. Rubber compounds, wire woven, heat-resistant, and many others.

FOR SERVICE AND INFORMATION ON BELTING AND HOSE CALL YOUR LOCAL HEWITT-ROBINS INDUSTRIAL SUPPLY DISTRIBUTOR LISTED IN THE "YELLOW PAGES"



GRIZZLY-KING superiority

You just can't appreciate the superiority of a Grizzly-King overhead eccentric jaw crusher until you've seen one in action and talked to those who have them.

Owners will tell you about tremendous production capacity, continuous service records, low jaw-die replacement costs, freedom from servicing and adjustment, low power costs.

No wonder Lippmann Grizzly-Kings continue to dominate the giant size (30x42 to 42x48) as well as regular size (12x36 to 24x36) overhead eccentric jaw crusher fields. A Grizzly-King was the world's largest 8 years ago and a Grizzly-King is still the world's largest today — in size (dimension and weight), in output (up to 1200 tons per hour) and in maintenance savings (only lubrication in most instances).

That is why the country's largest producers of crushed stone set production and service records with these Lippmann giants . . . and why others are installing them *now*.

You can get Grizzly-King benefits only by using "Grizzly-Kings." And remember this . . . not one of these big Lippmann crushers — whether 42x48 or smaller — has ever failed or failed to satisfy. Learn about Grizzly-King's advantages by contacting your local Lippmann dealer or the factory direct, today. Lippmann Engineering Works, 4623 W. Mitchell St., Milwaukee 14, Wisconsin.

1100–56–1

Typical comments from Grizzly-King owners everywhere: —

"Wouldn't have any other crusher but a Lippmann"

"Crushed 1,200,000 tons without turning jaw dies . . . and they're still going strong"

"During the 5 months it has been in service, it has required no adjusting or servicing except for lubrication"

"Maintenance? Haven't even replaced a die-bolt"

"Haven't turned my Grizzly-King dies even after 2½ million tons"

These 42x48 GRIZZLY-KING crushers, the biggest overhead eccentric jaw crushers ever built, are already established as performance kings in output and low-cost operation.

Davidson, N. C.

Sandusky, Ohio

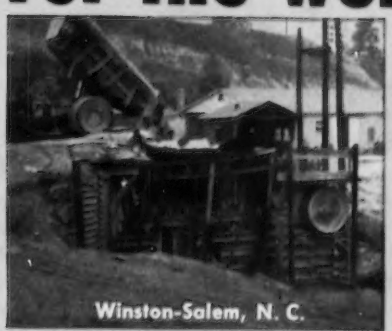
Chattanooga, Tenn.

Elizabethtown, Ky.

South Zanesville, Ohio

breaking rocks and records ...all over the world

These older installations of GRIZZLY-KING giants have been establishing themselves right along as production leaders in some of the biggest quarries.


Winston-Salem, N. C.

Byington, Ohio

Mitchell, Ohio

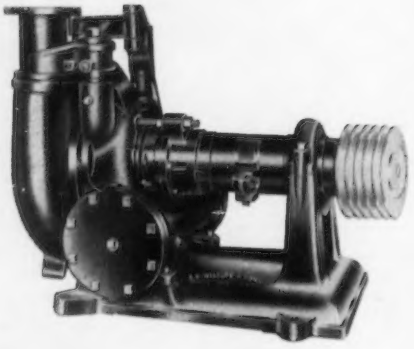
New Castle, Pa.

Bloomington, Ind.

LEW LIPPMANN

CRUSHERS FEEDERS SCREENS CONVEYORS CRUSHING & WASHING PLANTS

Why WILFLEY Sand Pumps Give You LOWER Pumping Costs:



1. Maintained High Efficiency
Wilfley's take-up adjustment allows maintained high efficiency throughout the life of the parts.

2. Low Maintenance Cost
The unique Wilfley design and rugged construction make little or no maintenance a reality.

3. Quick-Change Features
Absolute minimum downtime is required to change worn parts.

4. Interchangeable Metal or Rubber Parts
A selection of the right combination of rubber or hard alloy iron parts can be made to solve your pumping problems.

Wilfley Acid Pump — "COMPANIONS IN ECONOMICAL OPERATION" — Wilfley Sand Pump

Individual Engineering on Every Application

· Write, wire or phone for complete details.

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ENGINEERING AND MINING JOURNAL

SEPTEMBER 1956

What Public Relations Work Can Do for Mining

PUBLIC RELATIONS WORK has undergone three stages of evolution in our industry:

1. At first this function virtually ignored by most companies.

2. Then domestic and foreign operations were threatened with, or actually suffered, severe damage due to strikes, anti-trust suits, sabotage, high severance taxes, low depletion allowances, confiscation of properties, restrictive public land laws, government withdrawals of public domain for exploration, unsound conservation policies, unrealistic mining codes, etc. This forced a wave of defensive public relations efforts to avert or repair damage. (See Freeport Sulphur Co.'s courageous program to combat high depletion taxes in Louisiana, p 75.)

3. The final stage now evolving finds mining companies with vision setting up long-range programs. These are designed to anticipate troubles, and to maintain continuous harmonious relations between companies, governments, employees and the public at large.

But before these long-range programs can be put into full effect, company officers and management will have to take into account the changing world in which we live. No realistic management would gear current policies to the conditions that prevailed in many mining camps before World War II. We have only to look at the large townsites, recreation facilities, medical programs and improved working conditions at mine properties to see how far the industry has come.

Assuming then, that mining companies will continue to review conditions and revise programs to fit the times, one thing remains to be done—to be sure that the public, employees and their families, and Government officials and legislators know about it.

This is where a good public relations department comes into the picture. It will not have to resort to propaganda because its messages to the public will be based upon sound and fair policies which the company can be proud to talk about.

There are of course many other ways besides the press, or letters to employees to establish good public relations. Many mines are now permitting visitors to see surface operations, and non-hazardous parts of mills, smelters and hoisthouses. Mining associations and companies are preparing illustrated brochures explaining in simple terms how mines, mills and smelters operate. But still some segments of our population are extremely ignorant about the mining field. (See Behind the By-Lines p 74.)

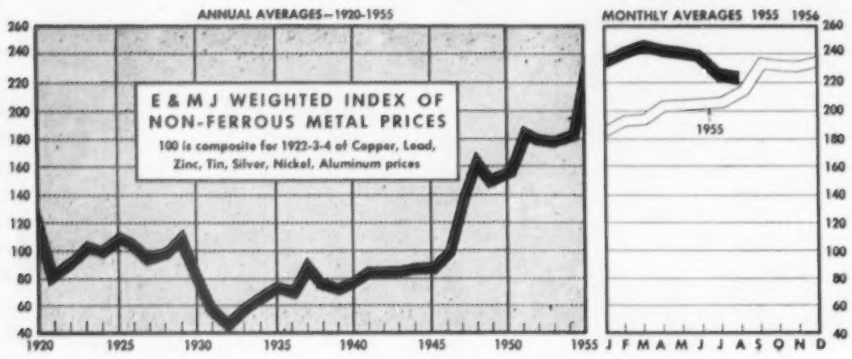
Vast improvement has been noted in company reports. Here is where mining has made its most notable gains because these reports go out to many thousands of stockholders. These reports enable management to spell out company policies and accomplishments, and report information is picked up widely by the national press.

National, state and regional mining associations are stressing greater contact with the outside public instead of merely acting as a sounding board for the woes of the industry at meetings where the audience already knows what the woes are.

Many more targets for a good public relations program could be mentioned, and many additional methods of doing the job could be cited. The important thing to note however, is that the mining industry can spend more of its time preventing wounds, and less time licking them if it is smart enough to anticipate the problems that lie ahead.

E&MJ OUTLOOK

PRICES



MARKETS

E&MJ's metal price index dropped from 229.77 for July to 226.82 for August. A sharp drop in copper prices more than offset gains in tin, silver and aluminum.

McGraw-Hill's Economics Department foresees an excellent volume of business for the nation during the months ahead. The replenishing of steel inventories, production of new automobiles. Government-backed highway and aircraft programs, and continuing expansion of the boom in capital goods will contribute to high-level activity.

This optimism is shared by many metal producers. Some companies are declining to offer lead and zinc to GSA stockpile because they believe they will need the metal to take care of their customers.

Federal Reserve Board does not want to see the present boom spark off a wave of inflation, so it is tightening up credit controls. This is a risky step to take during an election year, and the Democrats are already focussing their gunsights on FRB.

●

AT HOME

Anaconda plans to increase domestic copper production from 175,000 tons per year to 253,000 tons by 1961. The company expects to spend approximately $350-million during the next five years to expand its various operations.

World copper demand will be about 4,620,000 tons by 1960, according to estimates announced by Roy H. Glover, chairman of the Anaconda Co.

National Lead Co. is now producing refined nickel at its new Crum Lynne plant near Philadelphia. The plant will be in full production by the fourth quarter of this year.

AEC's post-1962 uranium-buying program will cause producers to parcipate in milling projects. Atlas Corp. is now acquiring a 30% interest in Uranium Reduction Co. See p 73.

●

LABOR

Pressures are building up to revamp national labor laws. Both Democratic and Republican party planks are more liberal than ever, and unions will expect Congress to review labor legislation. See p 122.

●

ABROAD

A recent geological survey of the Lower Zambesi Valley, Southern Rhodesia, indicates that the area is well worth investigating for such minerals as asbestos, nickel and platinum.

A 357,000-square mile aerial survey covering part of the Canadian Shield in Canada and northern U. S. has been started by leading U. S. and Canadian mining interests. The $2-million project will take about 30 months to complete.

Mercury production at the Palawan mine in the Philippines reached a peak of 277 flasks during July.

U. S. Copper August Sales Very Low; Primary Aluminum Prices Raised

ECONOMIC ACTIVITY IN AUGUST recovered somewhat from the low level to which it dropped in July. The drop had been largely a result of the steel strike. In August the steel strike was terminated and industrial production, as measured by the Federal Reserve Board's seasonally adjusted index, is estimated at about 139% of the 1947-'49 average.

The July index had dropped to 136% of the 1947-'49 average; drops in output of iron ore, coal and coke brought about by the steel strike contributed. Automobile output in August was probably a little under July as more manufacturers prepared to get out the new models.

Nonferrous metal prices in August dropped to 226.85% of the 1922-'24 average from 229.77% in July. The drop was solely a result of the fall in copper from 40.807c to 39.625c. Aluminum, tin and silver prices rose slightly.

Selling of refined copper in the U. S. in August was disappointing. Most copper factors had thought—or perhaps wished—fabricator buying in August in the U. S. would reach "normal" levels. We do not know what normal is, but taking the March and April average pricings together as 100%, pricings for August were about 70%. This is up from July's 65%. The June figure was about 84% and May was about 92%. The low level of August pricings is probably the most disappointing thing to happen in the copper industry in the U. S. this year. Many factors said that with the termination of the steel strike and of the vacation period in the fabricating industries, purchases and deliveries of refined copper would spurt up. They also pointed out that copper was purchased by fabricators several months before it appeared in an automobile and that buying would rise in August for the new models. But it has not, at least not significantly.

Sales data collected by other organizations, though they are not perfectly correlated with these statistics, show the same situation. There are also reports some mining firms that had contracts to deliver copper to the U. S. Government for the stockpile, have filled these contracts.

Sales of copper abroad have not dropped anywhere near the extent of sales in the U. S. Again taking the March-April period of 1956 as a base (but not assuming there is anything "normal" about this period) pricings reported to *E&MJ Metal & Mineral Markets* were 95% in August, 92.8% in May and the same in June. In July the figure spurted to 133%; this was a result of the scare buying brought on by the Suez situation. Some of this buying has occurred in August—sales early in the month were heavy but sales in the last three weeks were very low. Some factors look for several weeks more of low buying to compensate for the heavy buying earlier. (Total sales reported to *Metal & Mineral Markets* each month were usually about 150,000 to 175,000 tons.)

In spite of these difficulties, many sellers express optimism. Some factors say the 40c price is extremely profitable and that it can be maintained no matter how long poor sales persist. They suggest production may be cut back before the price is cut. Others point out that the heavy stocks of copper held by fabricators could be worked off in three months if their business picked up to the level of last winter and fall. They say, however, it would have to rise even higher if all of current production of refined copper were to be taken.

London prices moved about a great deal. The disturbed international situation pushed it up to about 40¾c prompt bid on Aug. 7. As the scare quieted it dropped to about 36½c on Aug. 21. More recently, the movements of troops into the eastern Mediterranean and apparent firmness on the part of France and to some extent the U. K., has strengthened London copper again. Katanga, which raised to 38.7c Aug. 9, dropped back to 37¾c on Aug. 23. A major U. S. custom smelter dropped back to 39c from 39¾c the same day. There is wide-spread feeling on the part of sellers that changes in the price will have no effect on the amount sold.

Labor contracts between Kennecott and the United Steelworkers at the Garfield refinery, and between AS&R and the same union for the smelter terminated August 31. The union is working on a day-to-day basis as negotiations continue.

Copper fabricator statistics for the U. S. in short tons follow:

	1955 June	1956 June	1956 July
Fabricator activity			
Shipments	133,386	(a)113,835	81,275
Sales	135,685	(a) 91,580	74,988
Unfilled orders	234,578	227,097	220,810
Fabricators' refined copper			
Stocks	327,696	451,126	465,015
On order	126,703	114,223	109,040
Receipts	133,709	(a)128,285	94,644

(a) revised

Fabricator activity refers to fabricated products; the lower three lines refer to refined copper.

Copper Institute data for June and July 1956, for sellers of refined copper, follow:

United States	June	July
Production:		
Crude, primary	(a) 98,496	84,970
Crude, secondary	(a) 12,471	10,369
Totals	(a) 110,967	95,339
Refined copper	(a) 136,713	125,401
Deliveries, refined	(a) 131,299	97,698
Stock at end, ref'd	(a) 60,671	87,944

Outside United States		
Production:		
Crude, primary	(a) 140,318	148,415
Crude, secondary	1,136	787
Totals	(a) 141,454	149,200
Refined copper	(a) 114,699	115,252
Deliveries, refined	(a) 105,415	101,102
Stock at end, ref'd	(a) 205,550	215,281

(a) Corrected figures.

Orders for aluminum fabricated and semi-fabricated products remain good though they are clearly below the high levels of last winter. Though some rise had been expected, it has not materialized. Some officials of independent aluminum fabricating firms say the industry rose to extraordinary high levels six months ago and it would be unwise to expect to reach such levels in the near future.

Alcoa raised pig prices 1c to 25c a lb delivered Aug. 10, Kaiser followed Aug. 11 and Reynolds Aug. 13, and Anaconda Aug. 13. They raised ingot prices by 1.2c to 27.1c. Alcan raised its price for aluminum delivered to consumers in the U. S. to 25c on Aug. 14. Our weighted average price for pig for August is 24.665c.

Strikes of the United Steelworkers with Alcoa and Reynolds were settled. Three-year contracts for a total wage increase of about 46c were signed.

Lead prices in the U. S. were steady through August. In London they reached a high of about 14¾c for prompt bid on Aug. 7; London prices then dropped but strengthened again at the end of the month as the Suez situation became "active" again. July shipments to consumers were low and the Government apparently got about 8,800 tons.

Zinc buying in August was better than July. But July was extremely low, partly owing to the steel strike. Though there has been some buying for auto production, especially of Special High, it has not reached the level anticipated. But the Government buying for foreign and domestic zinc is expected to prevent a price fall. London zinc prices moved about according as the Suez situation blew hot and cold. U. S. smelter stocks took a big jump in July to 103,253 tons from 69,704.

Quicksilver prices were stable in August. The price of $255-$257 may last longer. Many sellers have bought well ahead and have therefore no need to come into the market for spot metal.

Tin prices were strong in August owing to the threatening labor situation in Malaya and the Suez trouble. The termination of the steel strike also strengthened tin.

Refined nickel was shipped from the National Lead Co.'s Crum Lynne plant in Pennsylvania for the first time. It is the only nickel refining plant in the U. S. The metal is refined from nickel oxide from the U. S. Nicaro, Cuba, plant.

MARKETS *(Continued)*

Average Prices August (E&MJ Quotations)

Copper:	
Electrolytic, domestic refinery	39.625
Electrolytic, export refinery	37.667
Lead:	
Common, New York	16.000
Common, St. Louis	15.800
Silver and sterling exchange:	
Silver, New York, per oz.	90.614
Silver, London, pence per oz.	78.773
Sterling Exchange, "Checks"	278.306
Zinc:	
Prime Western, East St. Louis	13.500
Prime Western, delivered (g)	14.000
Tin:	
New York Straits	98.944
New York, 99% min. (e)	97.944
Gold, per oz. U. S. price	$ 35.000
Quicksilver, per flask	255.000
Antimony (E&MJ) (d)	36.470
Antimony, bulk, Laredo	33.000
Antimony, in cases, Laredo	33.500
Platinum, refined, per oz.	$104.037
Cadmium (a)	170.000
Cadmium (b)	170.000
Cadmium (c)	170.000
Aluminum, 99% plus ingot	26.699
Magnesium, ingot	34.694
Nickel (f)	64.500

Domestic quotations, unless otherwise stated, are in cents per pound. Sterling exchange checks, in cents. Quicksilver, per flask of 76 lb.
(a) Cadmium average based on the producers' quotations.
(b) Cadmium average based on the average of the producers' and platers' quotation.
(c) Cadmium average based on platers' quotation.
(d) Domestic, 5 tons or more but less than carload lots, packed in case f.o.b. New York.
(e) Tin content.
(f) F.o.b. Port Colborne, U.S. duty included.
(g) Delivered where freight exceeds 0.5c.

"Free" Gold Market

Trading volume dropped 9% in August, still high. Coin markets were active. Coin prices had a premium of about 25% above the official par value of bar gold. South American markets were quiet, except in Bolivia and Colombia, both in monetary difficulty. European centers were active; no Soviet gold sales were reported. African markets showed increased activity and large hoarding purchases of coins. Asiatic trading was brisk. Pick's World Currency Report quotes on "free gold" per fine oz:

	COINS		BARS (12.5 kg)	
	July 31	Aug. 31	July 31	Aug. 31
NEW YORK, transit			$35.08	$35.08
MANILA	$43.25	$43.75	36.10	36.10
HONG KONG	42.60	42.15	38.15	38.10
BOMBAY	58.00	56.25	55.25	54.25
TANGIER	42.40	41.75	34.94	34.95
BEYROUTH	43.75	44.00	35.16	35.20
PARIS	44.50	44.80	36.25	36.20
BUENOS AIRES	41.45	40.75	36.50	36.10

Note: Prices are quoted at the free or black market value of the U. S. dollar in the local markets.

Major Metals

U. S. DAILY AND AVERAGE PRICES

Aug. 1956	Electrolytic Copper (a) Domestic	Copper (b) Export	Lead New York	Lead St. Louis	Zinc (f) Delivered	Zinc East St. Louis	Aluminum Primary Pig 99%	Straits Tin New York
1	39.525	37.300	16.000	15.800	14.000	13.500	24.000	99.250
2	39.450	37.375	16.000	15.800	14.000	13.500	24.000	98.000
3	39.475	37.700	16.000	15.800	14.000	13.500	24.000	98.375
4	No Market	37.700	16.000	15.800	14.000	13.500	24.000	98.375
6	39.425	39.000	16.000	15.800	14.000	13.500	24.000	98.750
7	39.550	38.075	16.000	15.800	14.000	13.500	24.000	99.250
8	39.650	38.275	16.000	15.800	14.000	13.500	24.000	99.000
9	39.650	38.325	16.000	15.800	14.000	13.500	24.000	98.500
10	39.675	38.475	16.000	15.800	14.000	13.500	24.413	98.375
11	No Market	38.475	16.000	15.800	14.000	13.500	24.645	98.375
13	39.675	38.100	16.000	15.800	14.000	13.500	24.910	98.625
14	39.700	37.700	16.000	15.800	14.000	13.500	25.000	98.625
15	39.675	37.475	16.000	15.800	14.000	13.500	25.000	98.625
16	39.675	37.550	16.000	15.800	14.000	13.500	25.000	98.625
17	39.675	37.300	16.000	15.800	14.000	13.500	25.000	98.875
18	No Market	37.300	16.000	15.800	14.000	13.500	25.000	98.875
20	39.675	38.725	16.000	15.800	14.000	13.500	25.000	98.500
21	39.700	37.225	16.000	15.800	14.000	13.500	25.000	98.875
22	39.625	37.250	16.000	15.800	14.000	13.500	25.000	99.250
23	39.625	37.375	16.000	15.800	14.000	13.500	25.000	99.750
24	39.675	36.950	16.000	15.800	14.000	13.500	25.000	99.250
25	No Market	36.950	16.000	15.800	14.000	13.500	25.000	99.250
27	39.675	38.200	16.000	15.800	14.000	13.500	25.000	99.375
28	39.625	37.300	16.000	15.800	14.000	13.500	25.000	99.250
29	39.650	37.350	16.000	15.800	14.000	13.500	25.000	99.250
30	39.650	37.150	16.000	15.800	14.000	13.500	25.000	100.125
31	39.675	37.400	16.000	15.800	14.000	13.500	25.000	100.125
AVERAGES FOR MONTH								
Aug.	39.625	37.667	16.000	15.800	14.000	13.500	24.665	98.944
AVERAGES FOR WEEK								
Aug.								
1	39.475	36.217	16.000	15.800	14.000	13.500	24.000	99.375
8	39.510	38.021	16.000	15.800	14.000	13.500	24.000	98.625
15	39.675	38.092	16.000	15.800	14.000	13.500	24.661	98.521
22	39.670	37.392	16.000	15.800	14.000	13.500	25.000	98.833
29	39.650	37.354	16.000	15.800	14.000	13.500	25.000	99.354
CALENDAR WEEK AVERAGES								
Aug.								
4	39.465	37.054	16.000	15.800	14.000	13.500	24.000	99.083
11	39.590	38.438	16.000	15.800	14.000	13.500	24.176	98.708
18	39.680	37.571	16.000	15.800	14.000	13.500	24.985	98.708
25	39.660	37.246	16.000	15.800	14.000	13.500	25.000	99.146

Silver, Gold and Sterling

DAILY AND AVERAGE PRICES

Aug. 1956	Silver (c) New York	Silver London	Sterling Exchange "Checks"	Gold London	Gold (d) United States
1	90.125	78.500d.	278.5178	252s. 0d.	$35.00
2	90.125	78.500d.	278.3794	251s. 11½d.	35.00
3	90.125	78.500d.	278.2500	252s. ½d.	35.00
4	(e)	(e)	(e)	(e)	25.00
6	90.250	Holiday	278.2857	Holiday	35.00
7	90.500	78.750d.	278.3125	252s. 0d.	35.00
8	90.500	78.750d.	278.3750	251s. 9½d.	35.00
9	90.500	78.750d.	278.2946	251s. 8d.	35.00
10	90.750	78.750d.	278.1964	251s. 6½d.	35.00
11	(e)	(e)	(e)	(e)	35.00
13	90.750	79.000d.	278.2500	251s. 6¾d.	35.00
14	90.750	79.000d.	278.2321	251s. 6½d.	35.00
15	90.750	79.000d.	278.2500	251s. 6¾d.	35.06
16	90.750	79.000d.	278.2500	251s. 6½d.	35.00
17	90.750	79.000d.	278.3169	251s. 6½d.	35.00
18	(e)	(e)	(e)	(e)	35.00
20	90.750	78.750d.	278.4375	251s. 5½d.	35.00
21	90.750	78.750d.	278.4598	251s. 3¾d.	35.00
22	90.750	78.750d.	278.2812	251s. 5¼d.	35.00
23	90.750	78.750d.	278.2767	251s. 6¾d.	35.00
24	90.750	78.750d.	278.2410	251s. 6¾d.	35.00
25	(e)	(e)	(e)	(e)	35.00
27	90.750	78.750d.	278.2946	251s. 6¼d.	35.00
28	90.750	78.750d.	278.3303	251s. 5½d.	35.00
29	90.750	78.750d.	278.3125	251s. 5¼d.	35.00
30	90.750	78.750d.	278.2500	251s. 5¾d.	35.00
31	90.750	78.750d.	278.2500	251s. 5½d.	35.00
AVERAGES FOR MONTH					
Aug.	90.614	78.773	278.306		35.00
AVERAGES FOR WEEK					
Aug.					
1	90.125	—	278.567	—	$35.00
8	90.300	—	278.321	—	35.00
15	90.700	—	278.245	—	35.00
22	90.750	—	278.349	—	35.00
29	90.750	—	278.291	—	35.00

Calendar Week Averages: New York Silver: Aug. 4th, 90.125; 11th, 90.500; 18th, 90.750; 25th, 90.750.
(e) No Market (Saturday).

THE above quotations for major non-ferrous metals are our appraisal of the important United States markets, based on sales reported by producers and agencies. They are reduced to the basis of cash, New York or St. Louis. All prices, except gold or silver, are in cents per pound.

(a) Net prices at refineries on Atlantic seaboard. To arrive at the delivered New England basis add 0.300c per pound, the average differential for delivery charges.

(b) Our export quotations for copper reflects prices obtaining in the open market and is based on sales in the foreign market reduced to the f.o.b. refinery equivalent, Atlantic seaboard. On f.a.s. transactions we deduct 0.075c for lighterage, etc., to arrive at the f.o.b. refinery quotations.

Copper, lead and zinc quotations are based on sales for both prompt and future deliveries; tin quotations are for prompt delivery only.

Quotations for copper are for the ordinary forms of wirebars and ingots; cathodes are sold at a discount of 0.125c to 0.15c per pound. Quotations for zinc are based on Prime Western brands. Zinc in New York commands a premium over the St. Louis basis equal to the freight differential. Contract prices for High Grade zinc delivered in the East, Middle West, and West, effective Jan. 1, 1951, commanded a premium of 1.35c per pound over the current market for Prime Western; Special High Grade 1.75c effective Dec. 1, 1955.

(f) Prime Western delivered where freight from E. St. Louis exceeds one-half cent.

Quotations for lead are based on domestic common lead. Corroding lead commands a premium of 10 pounds.

(c) The daily silver quotation reported by Handy & Harman, in cents and fractions of a cent per troy ounce, is the price paid by Handy & Harman in settlement for silver contained in unrefined silver-bearing materials submitted to them for refining. It is determined on the basis of offers of bar silver .999 fine as made to Handy & Harmon for nearby delivery at New York by regular suppliers in quantities sufficient to meet daily requirements, and it is usually one quarter cent below the price at which such offers are made.

The Treasury's purchase price of newly mined domestic silver is 90.5 per troy ounce 1000 fine effective July 1, 1946. London silver in pence per troy ounce, basis .999 fine.

(d) U.S. Treasury's gold price. Actual payment by the United States Treasury for gold is at 99.75 per cent of the price quoted by the Treasury, which is equal to $34.9125.

London Metal Exchange Quotations

Aug.	COPPER Cash Bid	COPPER Cash Asked	COPPER 3 Mo. Bid	COPPER 3 Mo. Asked	LEAD Current Month Bid	LEAD Current Month Asked	LEAD 3 Mo. Bid	LEAD 3 Mo. Asked	ZINC Current Month Bid	ZINC Current Month Asked	ZINC 3 Mo. Bid	ZINC 3 Mo. Asked	TIN Cash Bid	TIN Cash Asked	TIN 3 Mo. Bid	TIN 3 Mo. Asked
1	307½	308½	306	306½	115⅝	116	114½	114¾	96	96½	95	95¼	778	779	773	774
2	314½	315	313½	314	116½	117	115	115¼	96	96¼	94¼	95	765	767	760	762
3	318	318½	317	317½	117¼	117½	115¼	115½	96¼	96½	95	95¼	767	767½	762	762½
6	Holiday															
7	325½	326	324	324½	118¼	118½	116½	116½	97½	98	96½	96½	774	775	769	770
8	317½	318	316	316½	117½	117¾	115½	115¾	96¾	97	95¼	95½	774	775	770	771
16	297	298	297	298	115½	115¾	113¾	114	95	95¼	93	93¼	769	770	767	768
17	296	296½	296	296½	115	115¼	113	113¼	94½	94¾	92½	93	766	767	764	765
20	293½	294	294	294½	114½	114¾	112¾	113	94½	94¾	92¾	93¼	764	765	761	762
21	290½	291	290½	291	114½	114¾	113	113½	94	94½	92¼	92¾	762	763	760	761
22	294½	295	295	295½	114½	114¾	113¼	113½	94¼	94½	92¾	93	764½	765½	763	764
23	298	298½	298	299	115	115¼	114	114¼	94¾	95	92½	93½	772	774	770	771
24	295	295½	295	295½	114½	114¾	113¾	114	94	94¼	92½	92½	768	769	766	767
27	296½	297	296½	297	114½	114¾	113½	113¾	93¾	94	92½	92¾	766	767	765	767
28	294	294½	293½	294	114¾	115	113¾	114	94¼	94½	93	93¼	762	764	761	762
29	296	297	296	297	114½	115	113¾	114	94¾	95	93¼	93½	763	764	761	763
30	301	301½	300½	301	115¼	115⅝	114¼	114½	94⅝	95¼	93¾	94	768	769	765	766
31	305½	306	305	305½	115¾	116	114½	114¾	95½	95¾	94¼	94½	772	773	769	770
Av'g's	£304.398		£303.966		£116.063		£114.489		£95.597		£94.017		£769.398		£766.375	

Prices are for the official a.m. session in pounds sterling per ton of 2240 lb. Copper basis wire bars lead 99.97%, zinc 98% and tin min. 99.75%.

Miscellaneous Metals, Ores, Minerals

Quotations cover wholesale lots, prompt shipments f.o.b. New York unless otherwise stated, tons of 2,000 lb unless otherwise noted. St—short ton, lt—long ton.

MISCELLANEOUS METALS

Aug. 31, 1956

Aluminum ingot, 99 plus % lb			27.1¢
Antimony, spot, lb, less than carload, in cases			36.47¢
In bulk, carload lots, f.o.b. Laredo			33.00¢
Bismuth, ton lots, lb			$2.25
Cadmium, commercial sticks, delivered, lb			$1.70
Calcium, lb, ton lots, 98%, cast			$2.05
Chromium, 97% grade, lb, contract			$1.25
Cobalt, 97 to 99%, per lb			$2.60
Germanium, per gram, 10,000 gram lots	44½¢	@	48½¢
Indium, troy oz			$2.25
Lithium, lb, 98%	$11.00	@	$14.00
Nickel, cathodes, lb, f.o.b. Port Colborne (a)			64½¢
Magnesium, 99.8%, carloads, lb, producer's plants, Velasco, Texas, Eff. Apr. 16			35½¢
Palladium, troy oz	$23.00	@	$24.00
Platinum (wholesale lots) troy oz	$103	@	$108
Quicksilver, flask of 76 lb, 25 flasks or more	$255	@	$257
Selenium, 99 plus %, lb. (Feb. 1)			$13.50
Silicon, minimum 97%, carloads, lb			20½¢
Tellurium, lb	$1.50	@	$1.75
Thallium, 100 lb or more, lb			$12.50
Titanium, 99.3 plus, grade A-1, max. 3% iron, lb			(b)$3.00

(a) Includes U. S. duty. (bE)ffective July 2 and July 9, 1956.

METALLIC ORES

Beryllium Ore, imported, 10% BeO, per short ton unit	$36.00	@	$38.00
Chrome Ore per long ton, f.o.b. cars Atl. ports, dry:			
44% Cr_2O_3 no ratio	$25	@	$26
48% Cr_2O_3 3 to 1 ratio	$55	@	$59.00
Iron Ore, Lake Superior, Lower Lake ports, long ton:			
Old Range bessemer			$11.25
Mesabi bessemer			$11.00
Mesabi, non-bessemer			$10.85
Lead (Galena), 80%, Joplin, Mo., ton			$201.32
Manganese Ore—Per long ton unit of Mn basis 48% manganese, nearby positions, subject to premiums and penalties $1.39 @ $1.45 c.i.f. U. S. ports, duty extra, nominal. Long-term contract nominal.			
Molybdenum Ore, 90%, per lb of Mo f.o.b. mines	$1.18	@	$1.23
Columbium-Tantalum, per lb, combined oxides	$1.15	@	$1.35
Tungsten Ore, per unit of WO_3:			
Foreign 60%, c.i.f. U. S. ports, duty extra	$32	@	$32.25
Domestic, scheelite, 60% f.o.b. mill (gov't price)			$55
Vanadium Ore, per lb of contained V_2O_5 f.o.b. mines			31¢
Zinc Ore, Prime, 60% concentrate, Joplin, Mo., per ton			$84.00

(a) Nominal. (b)Corrected.

METALLIC COMPOUNDS

Arsenous Oxide (arsenic trioxide) lb, in bbl carload lots delivered			5⅛¢
Cobalt Oxide, 72⅓% to 73⅓%, ceramic grade, per lb	$1.96	@	$1.98½
Copper Sulphate, 100 lb			(a)$15.20
Germanium Oxide, gram			27½¢
Molybdic trioxide, technical, per lb of Mo	$1.30	@	$1.33

ALLOYS

Ferrochrome 65 to 70%, per lb of Cr. (4-9% C)			20½¢
Ferromanganese, 74 to 76%, per lb., shipg. pt.			10.75¢
Ferromolybdenum, 58 to 64% Mo. lb of Mo contained	$1.68	@	$1.74
Ferrosilicon, 50% per lb of Si f.o.b. shipping point			12½¢
Ferrotungsten, 72 to 82%, lb of W contained (eff. Feb. 1)			$3.45
Ferrovanadium, per lb of V delivered	$3.10	@	$3.30
Silicomanganese, max. 1½% carbon, lb, contracts			12¢
Spiegeleisen, per long ton, 19 @ 21% grade			$96.00

(a) Eff. July 10, 1956.

NON-METALLIC MINERALS

Asbestos, f.o.b. Canada (Quebec) mines (U. S. funds) ton:			
Crude No. 1	$1,400	@	$1,725
Crude No. 2	$750	@	$1,100
Spinning fibers	$350	@	$650
Shingle fibers	$190	@	$210
Paper stock	$114	@	$137
Waste	$82	@	$84
Shorts	$28	@	$75
Asbestos, f.o.b. Vancouver, B. C. (U. S. funds):			
Spinning fiber	$460	@	750
Shingle fiber, effective Jan. 1	$205	@	$300
Asbestos, Vermont, f.o.b. Hyde Park:			
Spinning fibers	$353	@	$385
Shingle stock	$172	@	$190
Paper stock	$114	@	$145
Waste, stucco or plaster			$82
Refuse or Shorts	$39	@	$72
Barytes f.o.b. cars:			
Georgia, crude, per ton			$18
Missouri, 94% $BaSO_4$, per short ton			$16
Crude oil well grade, min. 4.3% sp. gravity, at			$11.50
Bauxite, long ton, f.o.b. point of shipment:			
Domestic crude, 50 to 52% (not dried)	(a)$5.00	@	$5.50
Domestic, chemical, 55 to 58%	(a)$8.50	@	$9.05
Domestic, abrasive, 80 to 84%	(a)$18.00	@	$18.50
Imported metallurgical, per lt, Job Br. Guiana, dep. on grade	$6.00	@	$7.00
Feldspar, bulk ton:			
Potash or soda feldspar, 200 mesh, ceramic grade	$18.50	@	$22.25
Glass feldspar, white, 20 mesh	$11.75	@	$12.50
Fluorspar, f.o.b. mines, bulk, 72½% effective, ton	$37	@	$39
60% effective CaF_2	$33	@	$35
Acid 97% concentrate, bulk, ton			$52.50
Fuller's earth, f.o.b. Georgia or Florida, ton	$7.00	@	$14.00
Magnesite, per ton dead-burned, bulk, f.o.b. Washington			$40.00
Mica—Domestic, f.o.b. mines. Punch 7¢ to 12¢ per lb according to size and quality. Sheet clear, 1½ x 2-inch, 70¢ to $1.10; 2 x 2 inch, $1.10 to $1.60; 2 x 3-inch, $1.60 @ $2.10; 3 x 3-inch, $1.80 @ $2.40; 3 x 4 inch, $2.00 @ $2.60; 3 x 5-inch, $2.60 @ $3.00; 4 x 6 inch, $2.75 @ $4.00; 6 x 8 inch, $4.00 @ $8.00. Wet ground, very fine, $140 @ $155 per ton. Bulk sales, dry ground: $32.50 @ $70.00 per ton. Scrap $25 and up.			
Ocher, Georgia, ton, in sacks	$26.50	@	$40.00
Pyrites, Spanish, per long ton unit of S, c.i.f. Atlantic ports			Not quoted
Sulphur, per lt, f.o.b. U. S. mines: bright			$26.50
dark			$25.50
Talc, f.o.b. works, ton:			
New York, purified	$18.50	@	$20.00
Vermont, extra white			$12.50
Tripoli, Missouri, ton:			
40-mesh, cream colored			$50.00

(a) Nominal.

IRON AND STEEL

Pig iron, gross ton, basic, Valley Furnaces			$62.50
Steel f.o.b. Pittsburgh, billets, net ton			$74.00
Structural shapes, Pa., Ala. etc., 100 lb	$4.85	@	$5.00

THIS MONTH IN MINING

AEC Wraps Up Uranium Mill Contracts

THERE IS MOUNTING EVIDENCE that the Atomic Energy Commission is moving rapidly to clean up its "back-log" of pending contracts for uranium mills.

In a few short weeks, AEC has announced signature of contracts with Texas Zinc Minerals for large mill at Mexican Hat and for a mill to be built by Dawn Mining Co. (Newmont Mining Corp.) at Spokane, Wash.; by Los Creek Oil & Uranium Co. at Split Rock, Wyo., and by Union Carbide Nuclear for new mill at Rifle, Colo., to be served by two-up-grader concentrators at Greenriver, Utah, and Slick Rock, Colo.

Commission spokesmen in Grand Junction add that approval of a mill for Lucky Mc-Utah Construction Co. in Gas Hills district of Fremont County, Wyo., is "imminent."

Basic understanding also has been reached with Vitro Corporation of America for a $1.2-million expansion into a new solvent extraction process at Salt Lake City. Contract signature is pending.

Except for a problem involving the Ute Milling Co., Atlas Corp. affiliate which has proposed a large concentrator for the Big Indian District of San Juan County, Utah, it is now believed that AEC is fairly current on proposals in Utah, Wyoming, Colorado, Arizona and other states.

Pending, of course, are a number of proposals involving the Ambrosia Lake district of McKinley County, N. M.

Trace Elements has yet to act affirmatively on its permit for a small mill at Maybell, Colo. Atomic Fuel Extraction Corp. has received permit for a mill at Bedrock, Colo., and Continental Uranium Corp. for a mill at La Sal, San Juan County, Utah.

It is understood generally on the Plateau that Trace Elements has yet to complete all of its financial arrangements for the Maybell project. Proprietors have even suggested the company would be sold, along with its AEC contract. Alternately, approaches have been made by Trace Elements officials for sale of ore reserves which would serve this mill to other concentrators in the area.

This recitation bears out predictions of a year ago that mill contracts would reach a "plateau" by end of 1956. Unless some unusual discoveries are made in the western states it seems that few, if any, new contracts will be signed during 1957.

Again, the possible exceptions involve the Ambrosia Lake area, where presently-discussed contracts may not be signed until next year.

Behind the situation, of course, is the amortization program past 1962 as well as a general "clean up" of areas which needed mills.

The new Dawn Mining Co. project to be located near Ford, Stephens County, Wash., will be first ever approved by AEC which would employ column ionic flowsheet.

However, Ute Milling Co. proposal is reported to incorporate this process as well.

Details of the Dawn process which was researched for the AEC by National Lead Co. and U. S. Bureau of Mines, includes: regular mill circuit utilizing acid leaching, countercurrent decantation, thickening followed by uranium recovery in ionic exchange columns.

The Dawn contract approval came as a surprise to some on the Plateau. It had been stated unofficially a year ago that AEC was not particularly interested in creation of new mills and purchasing districts in area expansion of uranium activity.

This was before the Commission worked out its post-1962 purchase program, however.

The question of size, price, et al, for a proposed mill reducing uraniferous lignites found in the Dakotas continued to plague AEC, in any event. Current quotations at around $8 a lb for uranium oxide delivered in new contracts is much below expectations of lignite program. It is therefore probable that if any contract is worked out, it will be strictly a pilot plant affair—permitting a somewhat higher price.

Similarly, AEC has dropped indefinitely its earlier program to recover uranium found in small quantities in the vast phosphate reserves of Utah, Idaho and southwest Wyoming. Western Phosphates, Inc., Garfield, Utah, was to incorporate such a recovery program in its plant.

Both the Los Creek and the Dawn Mining contracts contain specific instructions to "start promptly." The firms expect to complete the mills in 12 months.

Los Creek is letting immediate construction contracts. Western Knapp Engineering is handling design and general engineering responsibilities.

This mill will use an acid-drip, resin-in-pulp process researched for the firm by Colorado School of Mines Research Foundation, Inc. Robert W. Adams, Rawlins, Wyo., Los Creek president, said operations of a custom buying station was to commence Sept. 1. About 25% of capacity will be devoted to custom producers. The sampler will be operative in 90 days, Adams reports.

Graydon Salle, former superintendent of the AEC mill at Monticello, Utah, will manage the Los Creek facility.

Ore reserves of Los Creek were not disclosed.

Los Creek is given authority to buy in both Crooks Gap and Gas Hills segments of the Wind River mining district of Fremont County.

Meanwhile, Lucky Mc-Utah Construction report greatly increased ore reserves in their Gas Hills properties. No details on tonnages are given. The firm started out originally with plans for a 1,000-tpd concentrator which since was scaled down, according to announcement by officials, to about 750 tpd.

The arrival at contracts for the first mills in Wyoming is certain to relieve the objections, in part, to rationing of purchase of ore by AEC in the area.

An allocation of only about 200,000 tons has been given to the Riverton sampler of AEC—said allocation to run until mills and samplers are completed by private parties.

This program tends to commit millers to investment in a sizeable inventory of

(Continued on page 158)

Kennecott Enters Zirconium Processing

PILOT PLANT OPERATION of zirconium by Kennnecott Copper Corp. will be underway in late 1957 when the firm completes construction of facilities at Cleveland, Ohio, for production of electrolytic zirconium and the by-product hafnium.

Zirconium is a low-neutron absorber, with good structural capacities and a high degree of corrosion resistance. Charles R. Cox, president of Kennecott, noted that it has a potential in the chemical and allied industries and said that research on zirconium and other new metals is under way at Kennecott's new research center at Salt Lake City and at the company's subsidiary, Chase Brass and Copper Co., Waterbury, Conn.

Announcement of the new plant, which will begin construction shortly, followed completion of licensing arrangements with Horizons Titanium Corp., Princeton, N.J., under which Kennecott may also produce titanium, thorium, columbium and tantalum. Horizons Inc., parent of the licensing firm, has worked several years in the research and development field of processing new metals by the fused electrolytic method. Horizons will act as consultants for the project.

Kennecott's interest in zirconium during the past few years has focused on investigations of fabrication potential and physical properties, Cox said. He noted that extrusion of zirconium and its alloys in tube form had been Kennecott's principal contribution to date, and that from this a special jacketing technique has been developed by the company for making high-quality tubes for atomic reactors.

Pilot plant marks the first non-Government sponsored effort in zirconium. Facilities will be located in the Cleveland suburb of Bedford.

Dr. Harry Durney, Kennecott's resident engineer, has been assigned to begin liaison with Horizons on design plans. Durney will work with Dr. James Wyatt, head of the metallurgical department of Horizons.

National Lead Co.-AEC Contract Is Extended

ATOMIC ENERGY COMMISSION has extended its contract with National Lead Co. for operation of the Feed Materials Production Center, Fernald, Ohio through June 30, 1961. Extension also grants an estimated annual operating cost of $38-million.

National Lead has operated the Fernald property under the original contract since May 1, 1951 and conducts the AEC uranium processing mill at Monticello, Utah, the raw materials development laboratory at Winchester, Mass. and the ore testing plant at Grand Junction, Colo.

An expansion of the Fernald facilities, at an estimated cost of $20-million, was announced in October 1954. The operation of this expansion, to be completed this year, has also been included in the revised contract.

Vitro, Four Corners Ink Ore Processing Contract

A LONG-TERM AGREEMENT covering the mining and processing of uranium ores was signed in early August by J. Carlton Ward Jr., president of Vitro Corporation of America, and Eugene H. Sanders, president of Four Corners Uranium Corp.

Under the agreement, Four Corners will ship ore from its Green River, Utah mines to Vitro's Salt Lake mill, furnishing a minimum of 3,000 tons per month at the initiation of the program, with a possible increase to a maximum of 12,000 tons.

Life of the agreement extends to such time as Vitro no longer operates the Salt Lake mill or Four Corners' orebody is exhausted. Ward noted that the acquisition of Four Corners ore was "significant for the future operation of the Vitro mill," where a large expansion is projected and a new solvent extraction process is being installed.

Garfield Adds Capacity

A FIFTH CONTRACT PROCESS sulphuric acid plant at Garfield Chemical and Manufacturing Corp.'s installation at Garfield, Utah, will bring production of sulphuric acid to 1,100 tpd when construction is completed. New plant is located at the Garfield smelter of American Smelting and Refining Co., a co-owner of the chemical company with Kennecott Copper. Facility, to be operated by AS&R personnel, uses sulphur dioxide gas from the smelter's copper converter operation as raw material.

Daniel P. Eigo

As We Went to Press . . . .

Discovery of an "extremely important" zinc lode in Brazil, which also contains some copper, silver and lead, has been announced by USGS. The find, located in the Vazante area in northwest Minas Gerais, is part of the U. S. International Cooperation Administration program of the State Department, which carries on mutual research and development studies with friendly nations.

According to USGS and ICA, the deposit runs from a few meters to 60m in width for a length of four miles, with a yield of 35% Zn indicated by sampling. Drilling will begin shortly to verify a private reserve estimate of 3-million tons.

Property is owned by Jose Ermirio de Moraes, proprietor of the huge Votorantim Co., bauxite-aluminum-chemical producer. "Several" U. S. companies are reported negotiating with Sr. de Moraes on the discovery and USGS reports that 8 to 10 U. S. firms have contacted them for more information.

Stepped-up production of aluminum from an earlier capacity of 60,000 to 180,000 tons per year has been announced with formation of Olin Revere Metals Corp. New firm is a combination of Olin-Mathieson Chemical Corp., which last January announced construction of a 60,000-ton plant, and Revere Copper and Brass, Inc. The new $231-million concern will hold to the original O-M plan to build a reduction plant on the Ohio River (*E&MJ*, February 1956, p 158).

In other aluminum developments . . . Billiton Mij. of the Netherlands, Aluminum Industrie of Lausanne, Olin Mathieson and Vereinigte Aluminium Werke of Bonn have concluded an agreement to jointly explore for and develop bauxite mines . . . Three aluminum smelters are planned in India, one by Indian Aluminum Co., due in 1957, and two by the government, due by late 1962 . . . Consolidated Zinc Corp., Melbourne, has announced discovery of large deposits of bauxite in Queensland on Cape York.

Hidden Splendor Mining Co., subsidiary of Floyd Odlum's Atlas Corp., has acquired 30% interest in the New Uranium Reduction Co. mill at Moab, settling a major part of the problems of uranium mill construction on the Colorado Plateau (see story at left).

Deal becomes effective Oct. 15, providing Hidden Splendor agrees to supply "certain funds sufficient to meet all of Uranium Reduction's presently foreseeable capital requirements," according to Atlas' mid-year report. Odlum's firm will now cancel plans for a uranium mill at La Sal, Utah and all uranium ores controlled by Atlas and Hidden Splendor in the Big Indian District will go to Charles Steen's URC facility.

Kennecott Copper Co. and Koppers Co., Inc. plan submission, on Oct. 1, to the AEC of a plan to produce uranium feed materials. Proposal calls for construction and operation of a 5,000-ton per year facility, 50% owned by each of the firms.

National Lead Co. and Mallinckrodt Chemical, were, up to the announcement by C. R. Cox of Kennecott and F. C. Foy, of Koppers, the only entrants for the contract bid by AEC. Only other likely contender, according to observers, is Union Carbide Nuclear division of Union Carbide & Carbon Co.

Behind the By-Lines...

G. P. Lutjen

"Subject to changes in currency values and of course, excluding such upheavals as war, the price of lead should fluctuate about the present level of 16.00c per lb (New York) during the next twenty years, the inevitable fluctuations therefrom being both moderate and of short duration."

That, brother, is laying it on the line. And that is why *E&MJ* is so downright pleased to present another article by William P. Shea. Back in August 1955, we published Mr. Shea's article, "The Price of Copper, 1955-1975." To date no one has seriously disputed the conclusions set forth in that article. Now, this distinguished authority in the field of metal pricing, has made another of his thorough, competent commodity studies. This time he probes lead from now until 1975, and on p82, he shows how he came to the conclusion so frankly stated above.

When an expert of Mr. Shea's qualifications, equipped with facts garnered by penetrating research, writes bluntly about the future of one of the basic non-ferrous metals, we think you'll agree that it's "must" reading for every mining man.

A small grocery store on Route 22 in New Jersey sports a sign which has won the proprietor our sympathy.

THIS IS A NON-PROFIT ORGANIZATION
(WE DIDN'T PLAN IT THAT WAY BUT THAT'S THE WAY IT'S WORKING OUT)

Carefully strewing the floor with paper on the opposite page, is Miss Nancy Parkes, *E&MJ* copy editor. What with the July cover and now this, it seems to be our year for getting the crew into the magazine.

Nancy got into the act when we needed her help in illustrating our first article. The story tells how one company successfully fought a potentially crippling increase in state severance taxes, a predicament that could happen to anyone these days. We wanted to show the extent to which the press pitched into the battle, but without Nancy the string of clippings just seemed to lie there. With Nancy they still just lie there but in a much more enticing manner.

When Miss Parkes isn't littering the floor with old newspaper clippings, she operates the Personals department of the book and edits all the copy that appears each month which probably makes her one of our most constant readers. Part and parcel of this job is seeing to it that the other staff members get all their material in on time, a thankless task if we ever saw one. As a matter of fact her none-too-gentle harrying once drove one of our more erudite editors to parodying Andrew Marvell's immortal lines:

> Had we but world enough and time,
> This nagging, Nancy, were no crime.
> But always at our backs we hear,
> Your verbal battleaxe whistling near.

There's more but that will give you an idea of how awful things can get. If we weren't attending strictly to business, we'd mention that Nancy is single and that she raises and trains Irish Terriers as a hobby and that the ribbons those dogs have won would stretch out several furlongs beyond the newspaper clippings she is pictured with.

Surveys and polls are all the rage this season, and we've got one here for you that should be of interest. The objective was to see what people in a non-mining community know about our industry. The sample was 48 voters male and female from a small town in New York—a small sample but typical of the millions of voters who could be a help instead of a hindrance when it comes to legislation, if aware of the facts about mining.

We asked three questions. The first was designed to see if they had an idea of the value of one of our chief mining products. What is the price of copper per pound? "I have no idea," was the first thought of 35 people. The guesses ranged from 10c to "something over $25.00." The week of the Great Survey the average was 39.675c and four men and one woman named 40c, but 25 people didn't come within 25c of the correct answer.

Second question: How many uses do you know of for zinc? There were actually 22 people who didn't know of a single use for this important metal. Most of those who were able to come up with a few products using zinc named special alloys with which they were familiar in boating, or pharmaceuticals. Here's how the knowledge broke down on this question:

22 persons knew of 0 uses
9 persons knew of 1
15 persons knew of 2
1 person knew of 3
1 person knew of 4

We then asked our friends to name the first three non-ferrous metal mining companies they could think of. Here are the results in number of mentions.

Anaconda	38	Ventures	2
Kennecott	20	New Jersey Zinc	2
National Lead	15	AS&R	2
Inco	13	Newmont	1
Alcoa	12	Cerro De Pasco	1
Reynolds	8	Bunker Hill	1
Kaiser	6	Howe Sound	1
American Zinc	4	Miami Copper	1
St. Joe	3	Homestake	1
Phelps Dodge	3	Calumet & Hecla	1
Union Carbide	3	Noranda	1
American Metals	2	Quemont	1

Perhaps we should note that most of the strength shown by the aluminum companies came from people who remembered seeing the shows they sponsored on television. In case anybody adds the figures up, we should also add that two ladies could only think of the names of two companies.

Now, if you'll excuse us, we're going out and do some pondering.

Anti-tax editorials and articles poured from Louisiana and Texas papers as the battle was joined. *E&MJ's* copy editor, Nancy Parkes, measures 10 yards of them.

How One Company Fought Unfair Taxes

IN MAY 1956, Earl K. Long, brother of the late Huey P. Long and uncle of U. S. Senator Russell B. Long, took office as Governor of Louisiana. He had campaigned on a pledge that there would be no increase in state taxes. No sooner had the State Legislature convened, however, than the new administration launched a drive to impose severe tax increases on a number of Louisiana industries.

Among them was the sulphur industry. The Governor personally endorsed a measure virtually to triple the severance tax on sulphur, raising it from $1.03 per long ton to $3.00 per long ton.

This move spelled trouble for Freeport Sulphur Co. which produces 95% of Louisiana's 2-million-plus tons of annual sulphur output. The added tax bill proposed in the Governor's measure, House Bill 671, would run in the neighborhood of $4-million—a relatively enormous increase.

The neighboring state of Texas, biggest U. S. producer, imposes a severance tax of $1.40 on sulphur—less than half of the proposed Louisiana levy. Mexico, an important new source of sulphur, levies a severance tax much smaller even than that in Texas. Moreover, labor in Mexico is paid less for a day's work than Louisiana sulphur miners receive in an hour. And the Mexican producers, like the Texans, operate in high and dry terrain while Freeport has to wrestle with marshland locations.

Freeport would clearly be at a considerable competitive disadvantage if the tripled severance tax bill became law. Yet there seemed little hope of preventing its passage. The company was generally regarded as a good citizen in the State, to be sure, and there had been a continuing effort to keep the public informed about the nature of the industry and the high costs of marshland exploration, development and operation. But, on the other hand, the Governor had come into office on a landslide, his personal power was enormous, and he appeared to have virtually complete control over the Legislature.

Against this, Freeport had these points in its favor:

First, the Governor's pledge not to raise taxes was a matter of record, and there was strong sentiment in many quarters against allowing him to break it.

Second, under a recently ratified provision in the State Constitution, a vote of two-thirds of the membership of the Legislature was required for passage of a tax bill. The two-thirds rule had been approved over the Governor's stout opposition, indicating that the voters were in no mood for tax increases. (Actually, because the sulphur severance tax has long been in the Constitution, a two-thirds vote—plus ratification by the electorate—would have been required even without the two-thirds rule.)

Third, the singling out of an industry for a tripling of its tax was, by any reasonable standard, arbitrary and drastic—and could be shown to be so.

Freeport felt that it had a legitimate

case to make. The question was—should it try to make it? After all, bucking a Long in Louisiana is very much like tilting with the proverbial windmill. Active opposition to a strong State administration might only borrow more trouble for the future.

Company officials decided that there was too much at stake not to try. A corporation, they felt, had the same right of free speech as an individual and could go directly to the people of Louisiana with its story. So, as soon as the $3 tax bill was introduced by one of Long's supporters, the company issued an immediate statement to the press, stressing the damage that could be done both to the industry and to the State. Freeport was willing to pay —and did pay—its fair share of the tax load, the statement said, but—being no lion—why should it be singled out for the lion's share?

To Tell the Story

The company realized, of course, that one corporate voice in the wilderness would have little effect. The need was to tell the story to other groups and individuals throughout the State. If others were convinced the tax was wrong, perhaps they would help fight it.

The best and most immediate source of help was Freeport's own employees, who had been kept posted on the tax problem as it developed and knew exactly what the implications were. There was hardly a need to ask—the employees were already loaded for bear. They volunteered ideas, talked to friends and relatives, wrote letters, sent telegrams and personally called on legislators to make known their views.

The next most important source of help was the companies and individuals associated with Freeport in some way—stockholders, suppliers, royalty owners, customers. To them, Freeport sent personally addressed letters, enclosing a pocket-sized booklet explaining the implications of the proposed tax. The booklet entitled "Don't Put the Brakes on Progress!" was sprinkled with eye-catching cartoons. The cover showed a pelican—the state bird of Louisiana—chained to a ball labelled "H.B. 671." The pelican, in various poses, was used to illustrate other points in the text.

Letters and copies of the booklet were sent also to other influential persons throughout the state—officials and members of chambers of commerce, trade and civic organizations, professional groups. And finally, to reach the general public, an advertisement—"Open Letter from a Taxpayer to Members of the Legislature"

The Governor Attacked With Rhetoric . . . .

Earl Long "took the floor several times to cajole, threaten, chide, admonish and deride (his) opponents."

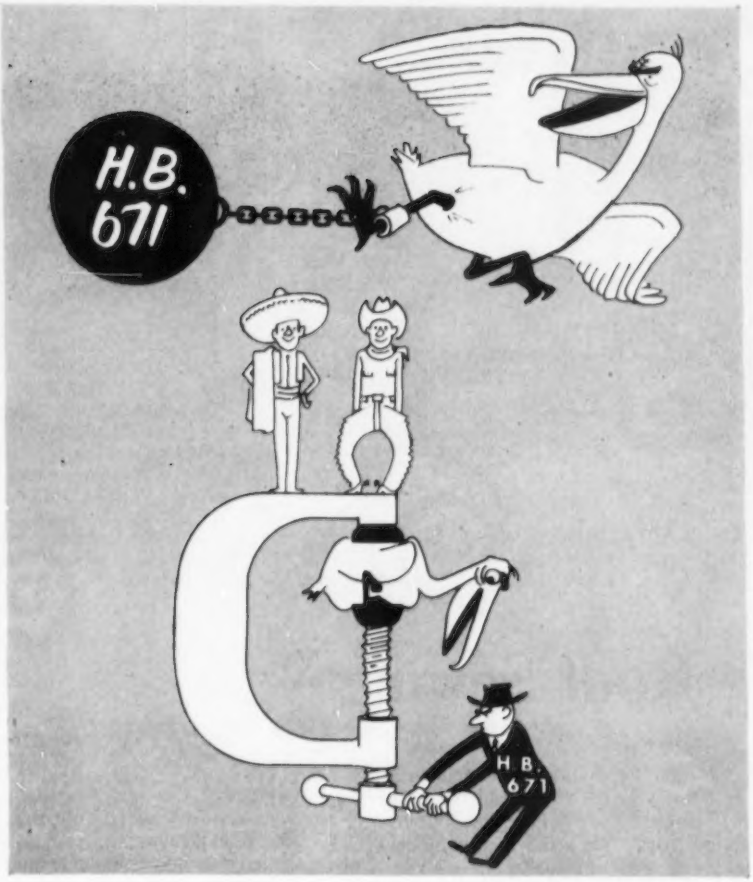
—was inserted in the daily and weekly newspapers. The advertisement set forth the company's position and concluded with the statement:

> "Since the (existing) tax was established, the (sulphur) industry has developed four new mines, increased employment four-fold and multiplied its severance tax payments six times over. The entire state has benefited. Why put the brakes now on this kind of progress?"

Louisiana newspapers, supplied with full information, came to the support of the company. The papers, in fact, well aware of the administration's no-tax pledge, had begun an editorial war against all tax increases. High industrial taxation, the papers reiterated, would only serve notice on potential new industry that Louisiana was a good state to stay out of.

The issue even received national attention. *Chemical Week* observed that expansion-minded chemical executives were eyeing the situation in Louisiana with some alarm—as possibly indicative of an unfriendly attitude to business in general. (Freeport itself was one of the alarmed expansionists. It was taking another look at its plans to build a plant in Louisiana for the refining of Cuban nickel and cobalt.) Newspapers not only in Louisiana but in Texas took editorial note of *Chemical Week's* report. The Texas approach was, as one editor put it: ". . . there is no reason why we (Texas) shouldn't be the beneficiary if our sister state means to commit industrial suicide."

A public hearing on the sulphur tax bill was held by the House Ways and Means Committee on June 5. A Freeport official, using charts to illustrate



The Company Answered With Facts

Freeport used cartoons of the pelican, state symbol, to show effect of the tax bill, out-of-state competition.

his main points, presented in detail the company's views. Surprisingly enough, the sponsor of the bill did not show up. But Governor Long did. And he did not confine himself to the merits of the proposal. According to the account of the *Baton Rouge State Times*, "The Governor took the floor several times to cajole, threaten, chide, admonish and deride opponents of the measure and members of the House comittee." The committee reported the bill favorably.

The House did not act on it immediately. The administration had not shown its expected strength on some previous bills, and was apparently delaying a showdown on sulphur. Freeport made good use of the lull. The press of Louisiana and Texas was continuing to sound its warning on the dangers of the sulphur and other taxes to the State's long-term progress. More national publications had commented on the situation, including *Engineering & Mining Journal*, the bulletin of the American Mining Congress, and *Newsweek*. Freeport published another statewide ad quoting these comments.

"Public opinion," said the subhead, "is overwhelmingly against House Bill 671. . . ." Following the press quotes, the conclusion read, "Let's heed this advice and not single out for drastic and unfair taxation a Louisiana industry that already is paying its fair share of the tax load."

To insure maximum readership, copies of the ad were also dispatched to every one of the 15,000 people who had received the booklets earlier. With the ad went a letter, again asking for support in the tax fight. "There is still time to bring the weight of public opinion to bear...," said the letter in part. "More is at stake than a single industry, for businessmen across the nation are watching to see how the wind will blow in Louisiana."

While the main theme of the argument continued to revolve around what was best for Louisiana's industrial growth, the issue was more specific in one section of the State. The two smallest of Freeport's four Louisiana mines, situated in Terrebonne and Lafourche Parishes, a couple of hours' drive west of New Orleans, would be in immediate trouble if the tax went through. To drive home the fact that jobs, payrolls and tax revenues provided by these properties were at stake, local company representatives went on the air over two radio stations in the area, spelling out the problem both in French (this is Cajun country) and in English.

The Opening Guns

By the week of June 17, Governor Long and his leaders in the House were ready to push through the administration's tax program. After an initial skirmish—distinguished initially by a number of accusations on the part of the Governor and a prompt denial by Freeport—House Bill 671 came up for a vote with its $3.00 provision reduced to $2.75. On a second ballot the figure was further reduced to $2.00. Both compromises were proposed by Long in an effort to rally borderline votes.

But the result was summed up quietly in the *New York Times* of June 30: "Freeport Sulphur Wins Tax Bout."

The headline might more accurately have read: "Public Opinion Wins Tax Bout." What Freeport did was to make sure that the public was informed about the consequences of the tax bill. The public took it from there to Louisiana's capitol hill, through newspaper editorials, letters and telegrams, and by word of mouth.

Governor Long has not by any means given up his efforts to impose drastic tax increases on sulphur—as well as on other industries. In the final days of the legislative session he forced through a bill to submit to the voters in November a Constitutional amendment to repeal the two-thirds requirement for passage of tax bills. Proponents of the two-thirds rule are marshalling their forces to preserve it. They contend that, under the conditions that prevail in Louisiana, the existence of the rule is a vital safeguard against drastic and arbitrary taxation. Other industries planning a move to Louisiana, or pondering the climate in their own states, may well watch November developments.

From Scandinavia—
Two Novel Methods For
Stronger Roof Support—I

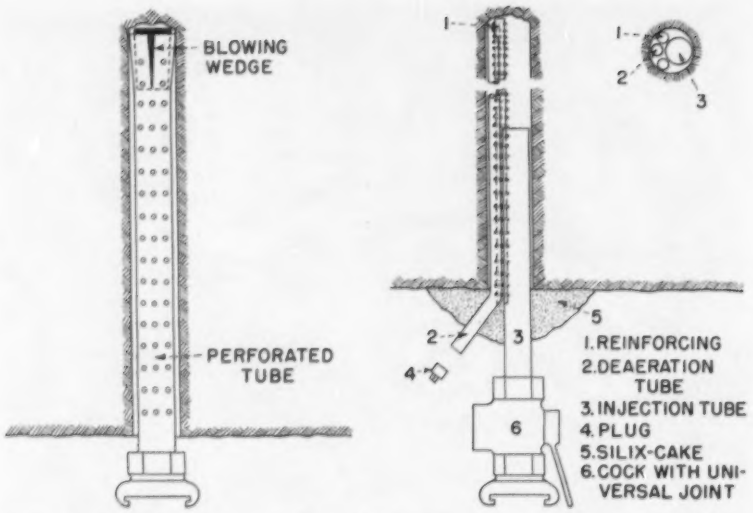


FIG. 1 AIR CUSHIONS which occurred with early methods (left) were later avoided by insertion of deaeration tubes. After unit is sealed in the hole, deaeration tube is plugged and water pressure applied via injection tube.

In Norway It's Roof Sewing

EINAR TROFTEN

"ROOF SEWING," developed at the Sulitjelma Mines in Norway, provides extra protection from dangerous backs by weaving a continuous arch of rock and concrete to carry the strain. The method is more costly than roof bolting but it has proven effective in difficult ground where traditional support methods might have failed.

Development of this new method of roof support began when Sulitjelma miners noticed that bolts placed on the roof to hang wires or to hold plates protecting against leaks, strengthened the roof. We all agreed that it was not possible to attain security for any length of time merely by using timber supports and scaling of the roof. I therefore prepared a plan for roof support without the use of timber. The original procedure for this was as follows:

Holes, 3m deep, were drilled perpendicular to the bedding. Distance between the holes varies with local conditions, but was usually about 2m. Rusty tubes from 3.4 to 1 in. were inserted in the holes and fastened by means of an iron wedge or a wooden pin. The plan was to perforate the tubes, fasten a universal joint to the outside end and finally connect a concrete pump. The arrangement is shown in Fig. 1.

Mr. Troften is chief engineer for Sulitjelma Mines, Ltd., in Norway.

At first we would not depend on a bolt that was not in contact with the walls of the drill hole throughout its entire length. We achieved this by cementing the bolt. We soon realized, however, that fastening with wedge or expansion sleeve was sufficient, and therefore we developed our roof bolting method on the basis of this principle.

Experience with cementing, however, was so interesting that we continued the tests, changing the method as we went along. Among other things, we noticed that air cushions were formed during the insertion of the cement paste, and later when checking up, we noticed a series of holes that were not filled. By inserting an "deaeration tube" we eliminated this difficulty.

The method eventually evolved which Sulitjelma miners named "roof-sewing," today takes the form shown in Fig. 2. Here is the procedure:

1. Drill holes are spotted according to local conditions. Usual depth is 2m and the distance between holes 1- to 2m. In bad rock it is necessary to drill more and deeper holes, while under natural arches the amount of drilling can be reduced.

2. Holes are flushed by simple blowing tubes. The holes must be big enough to provide room for injection, reinforcing and deaeration tubes at the same time.

3. After these tubes are put into place the edge around the hole and around the tubes and reinforcing is sealed by a paste containing cement mixed with pure Silix 3. This applies to places where the rock is dry. Where there are water leaks Silix 2 or Silix 4a is used. The paste solidifies in a few minutes, but it is safest to wait for a shift before further work starts.

4. This work includes plugging the deaeration tube and putting water pressure on the injection tube. It is often noticed that sludge and loose particles leak out through cracks located pretty far from the hole. The water is left on until all the sludge has disappeared and only pure water comes out from the cracks. Then ⅛-in. copper tubes about 10m long are placed in the cracks. The cracks are sealed with Silix-cement. The water is turned off and the concrete pump is connected to the injection tube.

5. The ratio of mixture for the paste may vary, but usually the following recipe can be used:

Water—20:1
Silix 3:1 to 5:1
Cement—1 sack
Intrusion aid—1/3 package

Intrusion aid makes the mortar smoother and easier to work with. It

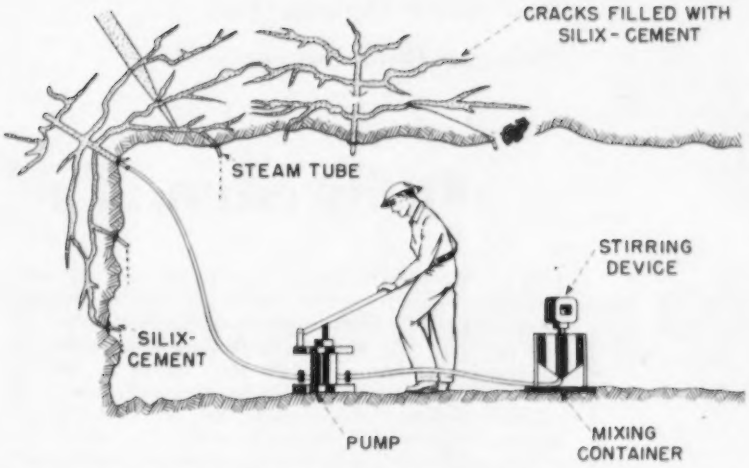


FIG. 2 CEMENT is pumped into the tubes after water has flushed them and nearby cracks clean. Deaeration tube takes air off, also signals when cement has filled all cavities with appearance of cement at tube mouth.

also counteracts the separation of the ingredients in the pump and tubes. The paste in the container must be agitated by means of a mechanical stirring device. (Fig. 2.)

6. With continuous stirring the cement paste is pumped through the injection tube, on which is mounted a cock. It is important that all the air in the hole be forced out. This is observed by paste escaping through the deaeration tube. The latter is then immediately plugged. The short copper tubes are pinched by means of nippers as soon as the paste starts extruding. The pressure from the pump may be increased to 30 kg per sq em but normally 20 kg per sq em is sufficient. For sealing of concrete walls 10 kg per sq em is sufficient.

7. The cock should not be removed from the injection tube until the cement paste has solidified. This takes 4 to 8 hours. Then the cock is carefully removed and the injection tube plugged. For this plugging loading sticks may be used. The cock is carefully cleaned before using it again.

Necessary Precautions

It is very important that the cement be absolutely fresh. It must be stored in a dry and heated room. The cement easily becomes gritty when stored in the mine and is then unfit for use for roof sewing even if the concrete seems to mature normally.

Injection work may also fail if the Silix fluid is exposed to frost.

Finally one has to make sure that the water used does not contain detrimental salts or gases which is often the case with water escaping from layers in the rock.

All Silix-cement solidifies quickly. Therefore all the preliminary work has to be finished so that the pumping of the paste can go on continuously without any loss of time except for the time needed to change over from one hole to another. The mixing container ought to be pumped out in less than a quarter of an hour. The container as well as the pump and tubes have to be cleaned thoroughly before preparing a new batch.

The procedure is simple, but if you don't know how, delays may be costly and the results poor.

As a check, sewn roof sections have been blasted down, and it has been found that the cement had leaked out from the holes through cracks and openings and actually woven the roof together to form a continuous concrete arch. In that way it is not only the reinforcing that holds the roof, but the fine network of filled cracks that go out from the hole.

This is the most important advantage of the rock sewing and one which makes it superior in certain cases to roof bolting which is both cheaper and simpler.

There are sections in the Sulitjelma mines where the rock is so poor that not even very closely spaced bolts give satisfactory security. When blasting to make room for compressors, transformers and mine hoists in these sections, the walls as well as the roof have been sewn and no disturbance has been noticed later.

Sewing may also be used in rock where water is a problem. The network of concrete will seal the roof as well as strengthen it, and one can, if necessary, drain the water through a hole that is drilled beforehand.

Other sealing jobs can be done; for instance in small tunnels where water is dammed up. It often happens that water is pressed out through layers in the roof but at such a distance above the concrete that cementing with Silix-cement is useless even when grooves are carefully cut in the rock. By means of the method and equipment just described, we have stopped such leaks completely. The method may also be used for sealing of air receivers.

Cost Example

To give the reader an idea of the cost of this method, I would like to give an example.

A roof was made up of chipped slate and the bottom of a "fat" layer containing chloride. The latter was a few meters thick and often gave way, causing uneven strain on the roof. Over an area of 50 sq m, 50 holes were drilled to a depth of 3m, or one hole for every square meter. Materials used per square meter were as follows:

¼-in. steam tubes	3.15 m running meter
10mm steel bar	6.10 m at 0.648 kg/m
¾-in. injection tubes	50 pcs of 20 cm length
Cement	About 10 kg
Silix 3	About 1.5 kg

To this, add some ¼-in. copper tubes, 100 mm long, and 1/15 package of intrusion aid.

Time spent on each square meter:

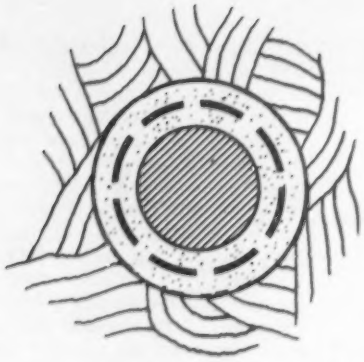
Drilling	1.45 hours
Scaling	0.20
Placing of reinforcing	0.16
Sealing of tubes	0.96
Sealing of cracks	0.32
Pumping of the cement paste	1.28
Total	4.37 hours

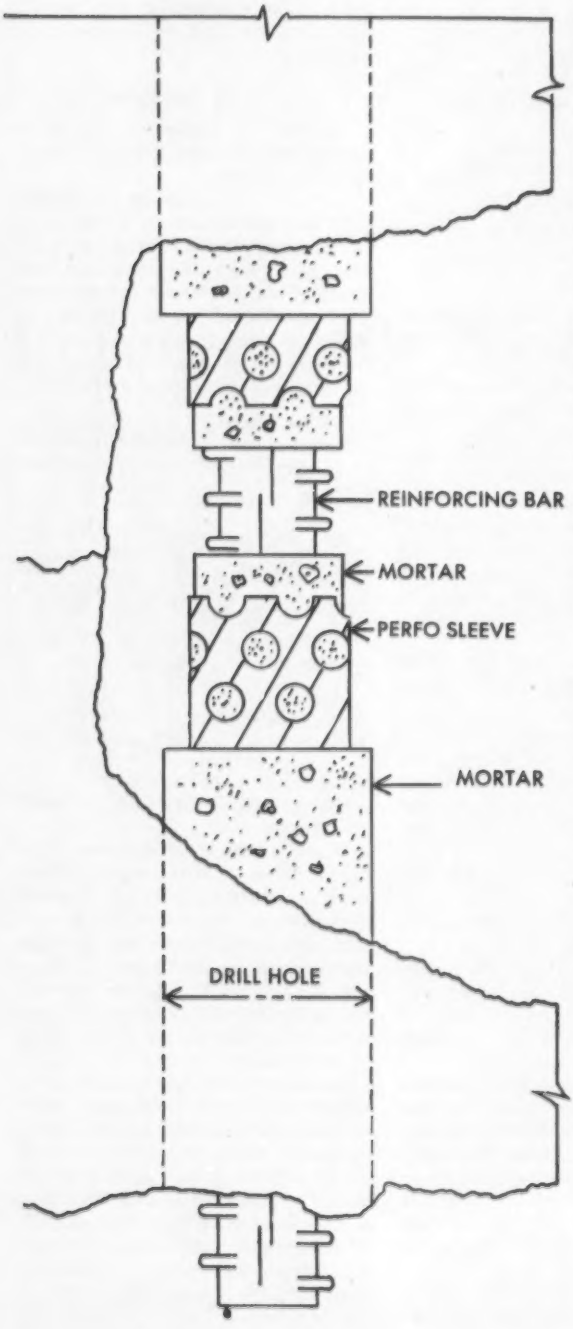
For greater areas labor cost may be less.

If one hole is drilled for every square meter of roof area, and these holes are 3m deep with a reinforcing of 2 pieces of 10mm steel bars in each hole, this reinforcing can support a load equal to 2 x 0.79 sq cm x 1900 kg per sq cm = 300 kg which corresponds to the weight of more than one cubic meter of rock per square meter of roof area.

In addition there were some ¼-in. copper tubing, 1/15 package of intrusion aid, and finally the mechanical equipment which must be amortized.

The different brands of Silix are delivered by Engineer Harald Henschien & Co., Oslo, who also offers detailed information as to their use. This firm also delivers the necessary mechanical equipment for sewing rock as well as the steel bars.





From Scandinavia—
Two Novel Methods For
Stronger Roof Support—II

In Sweden, The

ONE OF THE NEWER IDEAS recently imported into this country, a byproduct of the tremendous Swedish program to get important permanent plants underground, is a roof bolt for areas with poor anchorage, active corrosion, or weaknesses in shear strength. This method of bolting attempts to provide unconcentrated even anchorage, with anti-corrosion mortar encasement, and dry pack solidity resistant to shear. Here is how it works:

You start with a pair of half cylindrical sheet metal tubes, with perforated walls equal in length to the drilled bolt hole. The diameter of the tube is less than that of the drilled hole yet slightly larger than the size of the bolt to be placed. A firm sand and cement mortar mix (with or without accelerators or expendifiers) is first trowelled into the semicylindrical tube halves. Once filled flush, the two halves are coupled and fastened together to make a perforated sheet metal tube full of damp mortar. The filled tube is inserted into the drilled hole. The bolt to be used is then hammered into the tube hole, thereby extruding mortar out evenly along the length of the perforated tube as the bar progresses into it.

Relative volumes of the bolt, tube (called Perfo), and holes are correlated to insure that an excess of mortar will more than fill the voids.

In driving in the bolt, sledgehammers won't work; the vibration of a chipping or electrical hammer apparently does the trick. The bolt may be threaded, smooth, or even deformed. In Sweden, they often use an ordinary reinforcing bar, with or without an anchor plate. After the bolt is fully seated, one has a completely filled drill hole, reinforced with stressed or unstressed steel. The mortar shell completely encases the unit, transferring the anchorage load uniformly throughout the entire length, while at the same time acting as a sizable shear pin to resist lateral movement of rock strata.

Such a mortar encased unit is not a cure-all. There are still many areas where timbers and ribbing are needed. Costs probably will slightly exceed that of ungrouted or unmortared bolts. Instantaneous holding power can be achieved only by incorporating Perfo with the wedge type anchor or by excessive use of mortar setting accelerators. But if the Perfo metallic tube method can enable another 10% of the U. S. mines to enjoy the benefits and savings of roof bolting, it will be welcome.

Advantages

Permanency of the installation is virtually guaranteed by mortar protection against air scaling, corrosion and erosion.

Method Is Simple

Uniformly distributed anchorage means more gross load can be applied to weak ground or to incalculable ground with lower stresses. Thus in soft sandstone or shale, sufficient anchorage might be atttained to warrant roof bolting.

No collecting channel for ground water is available when the mortar fills and seals the hole, and the long bar encasement assures very high tensile and shear strengths.

In good rock, with plain unaccelerated mortar, a 6-ft long, 1-in. round deformed reinforcing bar can hold 27 tons after 24 hours. In 4 days this unit can hold the bar strength—34 tons. With accelerators, U. S. distributors of Perfo, Sika Chemical Corp. of Passaic, N. J., feel safe in assuring as high as 15-ton strength in 6 hours, or under emergency conditions, 10 tons in 2 hours.

Adaptability

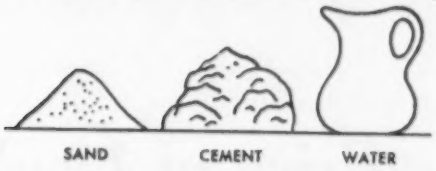
Both length and shape and mortar mix should be varied to provide the best results for a given rock condition. The shear strength of the unit is obvious. How many roofs today could be strengthened by preventing any lateral movement whatsoever between successive rock strata? Side-slippage, sloughing, earth bulging and rock popping can all be reduced by the installation of a unit high in shear strength; and what unit can have higher strength than a steel bar encased in a high pressure dry pack?

It might be added incidentally, that, in Sweden, short Perfo units are apparently being used a lot as tie anchors or dowel seats to tie concrete to rock, concrete to concrete, or steel to either.

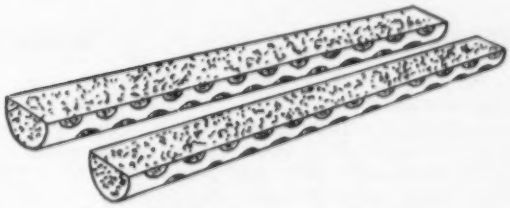
Where has the Perfo been really tested? Most of its usage has been in Sweden. A good typical example would be the Kilforsen and Stornorrfors hydroelectric plants where the units were used to obtain permanent roof support. The machine hall in the former plant (a room 60 x 315 ft) used a great number of Perfo tubes. Among projects outside of Sweden are the tunnels in Egypt's mammoth Aswan Dam project.

Four mines in the United States are currently making first run tryouts on the technique of installing Perfo bolts. The Bureau of Mines has indicated interest in these units. Formal approval has not yet been sought. Canadian mines are making way for the introduction of this new bolt in some of their most troublesome areas. The typical Perfo tube and roof bolt assembly is only warranted where other bolts cannot meet the challenge of permanence or strength. But in those areas where it is warranted, a good look should be taken at this new Swedish technique of improving roof strength.

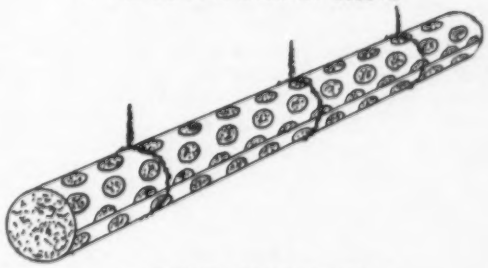
Five Steps to Perfo Rock Bolting



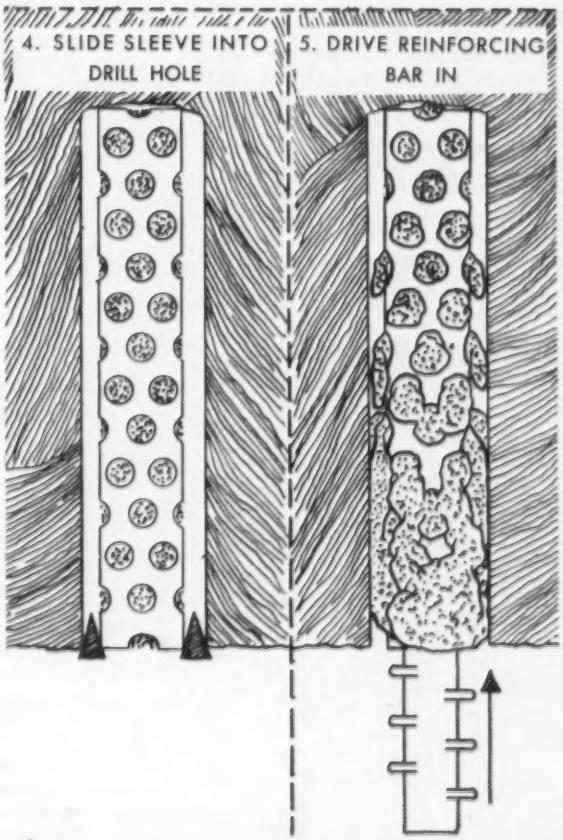
1. MIX A RICH PLASTIC MORTAR



2. FILL BOTH HALVES OF SLEEVE



3. TIE SLEEVES TOGETHER



The Price of Lead 1956-1975

WILLIAM P. SHEA

SUBJECT TO CHANGES in currency values and of course excluding such upheavals as war, the price of lead should fluctuate about the present level of 16.00 cents per pound (New York) during the next twenty years, the inevitable fluctuations therefrom being both moderate and of short duration.

World industrial use of lead seems established on a well-defined trend which indicates for 1975 levels on the order of:

World	3,500,000 short tons
U. S.	1,450,000 short tons

The world has ample reserves of lead-bearing ores to meet prospective demand, and present price-cost relationships throughout the world provide sufficient profit margin to induce continuing development of such reserves to meet year by year requirements.

Lead is a necessitous industrial commodity required annually in large volume. Presumably, its present price level of 16.00c per pound is sufficient to assure production adequate to meet requirements during the foreseeable future. However, the volume-times-price index of lead will vary with the general volume-times-price index of all industrial commodities during the years 1956-1975.

Changing Patterns of Use and Supply

The long term stability of lead's use in industry is apparent from the accompanying Chart I which shows the U. S. and the World Use of Lead over the past fifty-five years.

Such steady growth applies only to the total industrial use of lead. Among individual uses there has been wide variety in rates of growth. In U. S. since 1913 use of lead in storage batteries has increased by 488%, in solder by 340%, in calking by 287%. Use in white lead, however, is only 19% of what it was 42 years ago. Tetraethyl gasoline, unheard of in 1913, is now the second largest consumer. Total use of lead during 1955 in U. S. showed an increase over 1913 and during the period of 42 years a consistent upward trend has been in evidence. In the same way total use of lead for the world as a whole (including USSR) continues on a well established long term trend.

These trends have been projected to the year 1975, not as estimates of tonnages to be expected for any given year, but rather to show the levels about which future requirements may be expected to fluctuate.

U. S. mine production established a peak in the period 1925-29. Since that period, and despite large increases in market prices, U. S. mine production has declined to the point where 1955 registered only 50% of the 1925-29 period. Total British Commonwealth mine production in 1955 was 125% of average 1925-29 production and Western Europe's 1955 total was 92% of 1925-29. These three areas, taken together, for many years accounted for the bulk of the world's mine production of lead. They made up 93% of the world's total during 1913-14 and 80% during 1936-39, but only 56% in 1955.

Areas Increasing Output

On the other hand, large increases have been registered by Latin America and by Eastern Europe and by Africa (outside British Commonwealth). These latter three areas have increased their total mine production from 363,000 short tons (20% of the world's total) in 1925-29 to 930,000 short tons (43% of the world's total) in 1955.

Sources Are Changing

Thus the world's consistently expanding requirements of lead are being met less and less by formerly major sources of supply and more and more by the newly developed and developing sources.

The most important development of needed new supplies in large volume, however, seems to have come from reclamation of secondary lead. The world's total recovery of secondary lead as shown on Table I is necessarily on an estimated basis. Official data have been published for U. S. for the whole period 1913-1955 and for the U. K. since 1942. They are derivable for the U. K. for prior years and for Japan since 1940. Yearly recoveries in USSR since 1936 have been estimated in a study published in U. K. (C. F. Metal Bulletin, March 20, 1953). It is assumed, for this study, that secondary lead recovery throughout Western Europe has been approximately equal year by year to that in U. K. With allowances for the probable inaccuracies contained in such a basis of estimation, increases in the rates of recovery of secondary lead seem to have been approximately as follows:

Table IA. World Lead Position 1936-1955

	Supply	Thousands of short tons
Jan. 1, 1936	Refinery Stocks U. S.	222
	(Assuming same percentage relationship to industrial use as in U. S.)	
	Refinery stocks outside U. S.	Est. 578
	World total refinery stocks	Est. 800
1936–1955	World mine production of lead	34,722
	Est. recovery of secondary lead	15,722
	Total lead available (20 years)	51,244
	Disposal	
1936–1955	World industrial use of lead	49,845
Dec. 31, 1955	Refinery stocks U. S.	31
	(Assuming same percentage relationship to industrial use as in U. S.)	
	Refinery stocks outside U. S.	Est. 53
	Held in Government stockpiles (1,200–1,500)	Est. 1,200
	Total disposal of lead (20 years)	51,129

Mr. Shea is statistician for C. Tennant Sons & Co., New York, N. Y.

Estimated Recovery of Secondary Lead

(Thousands of short tons)

	Avg. 1913–14	1955	% increase
U. S.	67	500	647
World outside U. S.	122	640	425
World total	189	1140	503

During the entire period the world total mine production has increased by 74% and the world total industrial use by 128%.

Meeting Future Requirements

As compared with 1955, future industrial requirements of lead are indicated on Table II as follows:

Estimated Future Industrial Requirements of Lead

(Thousands of short tons)

	1955	1960	1975
U. S.	1206	1275	1450
World outside U. S.	2076	1925	2050
World total	3282	3200	3500

The U. S. and U. K. together are estimated to have held in stockpile in excess of 1,100,000 short tons of lead at the end of 1955. It is probable that other countries have accumulated similar stockpiles, on more modest scales. USSR and her satellites have been accumulating lead to the extent that circumstances have permitted. So it is likely that total government stockpiles throughout the world currently amount to 1,200,000 to 1,500,000 short tons and at least the U. S. stockpile is still on the increase. Practically all have been acquired since 1945 at an average rate of 120,000 to 150,000 short tons per year. Prospective world industrial requirements (Chart I) by the year 1975 call for an increase of 218,000 short tons over 1955. If it may be assumed that (beginning say, with 1960) there will be no further additions to, and no appreciable releases from the various government stockpiles, then the world's mine and secondary sources will need to step up present production by 218,000 tons, an increase over 1955 production of less than 10%.

Normally the amount of secondary lead available in any country depends upon the amount of lead that has been put to use in industry during, say, the previous ten years. About 75% of lead used in automobile batteries becomes available for secondary recovery after two to three years of use; 33% to 60% of lead used for cable covering, in buildings, bearing metal, solder, type metal, calkings and other uses becomes available for secondary recovery after ten to twenty years of use. In U. S. secondary recovery is now about 500,000 tons per year and in countries outside of U. S. (estimated) about 640,000 tons per year. These figures are bound to grow as the world's total consumption of lead increases year after year in accordance with the long term trend shown on Table I. It is likely that world total recovery of secondary lead by 1975 will be in the neighborhood of 1,200,000 tons per year (1,140,000 in 1955). Indicated industrial requirements therefore will be met about as follows:

(Thousands of short tons)

	1955	Est. 1975
Mine production	2,182	2,300
Secondary production	1,140	1,200
Total supply	3,322	3,500
Total industrial requirements	3,282	3,500
Excess production over industrial requirements	42	–0–
Derived from stocks	45	–0–
To stockpile	85	–0–

Thus mine production in 1975 need be only about 5% over 1955.

World Lead Reserves

The world's total reserves of lead contained in ore have recently been estimated at more than 40-million short tons and are probably sufficient to continue the 1955 rate of production for twenty years. Figures on what constitutes reserves, however, can be misleading. Beyond the depletion of known reserves of ore by actual mining operations and their accretion by exploration and development work, reserves may be increased or decreased by constantly changing factors such as market price, mining and smelting technology, labor and power costs. Actually, while there are many deposits of lead-containing ores in the earth's crust, ore reserves constitute only that portion which may be mined, smelted and delivered to market profitably.

It may not be supposed therefore that the 40-million plus tons of lead presently estimated as contained in existing ore reserves constitute all the lead that will be ultimately available from the earth's crust but, at present prices and operating costs, it may be assumed to be a fair estimate of what is presently available for profitable extraction. A practical guide toward future increases in production would be the demonstrated profitability of exploiting any given deposit of ore. In determining the most likely sources of (increased or decreased) lead production during the next twenty years a tabulation of the past and present costs of operation of various mining properties seems to be in order. All the companies in the accompanying tabulation are major producers of lead and of zinc, there being nowadays few mines of significant size producing only lead. All the companies used in this tabulation have been in operation, with the exception of one Australian and one South African company, since 1936 and all have extensive ore reserves on which to base future operating schedules. See p 86.

Because it would be impracticable to try to separate, in so many cases, over-all corporate costs as between lead production and zinc production, the determinant used is the cost of production per pound of metal, that is, of lead and zinc mined. Most of these companies have other profitable activities than the production of lead and zinc but, for the purpose of this study, all sources of income are here considered as offsets to the costs of mining lead and zinc.

Total cost is therefore calculated to be the difference between the average market price of lead-zinc received by each company in any given year and the net income of the company per pound of metal produced during that year. That is, it is the total cost for each company of extracting a pound of metal from its ore reserves and getting it to market in finished form.

Because taxes on profits and other taxes on the mining industry, particularly outside U. S., are, and will continue for a long time to be an important part of the cost of operation,

Table I. World Use of Lead 1913-1955

(Thousands of short tons)

	Avg. 1913–14	Avg. 1915–18	Avg. 1919–21	Avg. 1922–24	Avg. 1925–29	Avg. 1930–35	Avg. 1936–39	Avg. 1940–45	Avg. 1946–50	Avg. 1951–54	Prel. 1955	Est. 1956	Est. 1960	Est. 1975
U. S.*	519	581	557	757	903	537	634	1,014	1,061	1,120	1,206	1,100	1,275	1,450
Latin America														
Mexico	...	...	...	...	...	5	5	7	9	11	20			
Argentina	...	...	...	...	...	9	12	20	34	29	28			
Brazil	...	...	...	...	...	6	9	20	18	21	15			
Others	...	...	...	...	...	1	4	6	5	4	4			
Total Latin Amer.	11	27	10	25	33	21	30	53	66	65	67			
British Commonwealth														
United Kingdom*	215	214	185	211	289	312	406	343	366	356	415			
Canada	29	52	22	25	33	21	25	56	59	61	67			
Australia, New Zealand	10	14	12	14	17	17	28	50	47	49	57			
India	2	4	...	5	6	9	10	20	9	10	16			
South Africa	2	2	2	2	4	5	7	10	9	17	20			
Total Brit. Comm.	258	286	221	257	349	364	476	479	490	493	575			
Europe														
West	475	339	228	322	514	472	593	385	308	513	624			
East (Satellites)	...	...	10	13	23	35	44	*25	*42	*54	52			
USSR	64	43	1	6	40	57	105	82	97	186	255			
Japan	27	41	42	57	77	98	119	61	28	38	49			
China							14	*5	*10	*10	...			
Others	...	...	...	...	...	...	...	...	...	3	4			
Total	1,354	1,317	1,069	1,437	1,939	1,584	2,015	2,104	2,102	2,482	2,832			
Plus estimated secondary lead outside U. S. & U. K.	85	100	90	150	185	175	200	178	293	435	450			
Total world use	1,439	1,417	1,159	1,587	2,124	1,759	2,215	2,282	2,395	2,917	3,282	3,135	3,200	3,500
Added to Govt. stockpiles:														
U. S.									Av. 72	150	65	65	...	...
U. K.								Av. 4	2	15	20		...	...
Others														
Total world requirements	1,439	1,417	1,159	1,587	2,124	1,759	2,215	2,286	2,469	3,082	3,367	3,200	3,200	3,500

*U. S. & U. K. figures include secondary.

Secondary:														
U. S.	67	92	117	186	230	232	251	336	460	489	500			
U. K.	*37	*38	*40	*73	*94	*96	*81	91	168	187	190			
W. Europe								*100	*175	300	340			
USSR	*85	*100	*90	*150	*185	*175	*200	25	34	*48	50			
Japan								48	34	49	50			
Other								*5	*5	8	10			
Total	*189	*230	*247	*409	*559	*503	*532	*605	*876	1,111	1,140	1,100	1,200	1,200

*Estimated.

Table II. Industrial Use of Lead in U. S. 1913-1952

(Thousands of short tons)

	Avg. 1913–14	Avg. 1915–18	Avg. 1919–21	Avg. 1922–24	Avg. 1925–29	Avg. 1930–35	Avg. 1936–39	Avg. 1940–45	Avg. 1946–50	Avg. 1951–54	1955	Est. 1960	Est. 1975
Storage batteries	64	91	98	148	195	157	187	259	340	344	376		
White lead	100	104	121	145	124	70	80	65	38	21	19		
Red lead & litharge	35	34	34	37	35	35	53	76	62	72	88		
Cable covering	60	87	66	121	180	81	72	138	144	141	121		
Building	75	76	62	76	92	36	43	80	63	57	59		
Ammunition	35	49	31	35	38	30	36	85	33	32	47		
Foil	25	23	21	32	37	19	24	21	3	4	5		
Bearing metal	35	35	31	35	38	15	13	29	37	30	33		
Solder	20	17	14	27	36	19	20	37	65	67	88		
Typemetal	10	6	8	12	16	13	15	21	29	25	26		
Calking	15	7	23	24	31	13	14	30	45	46	58		
Tetraethyl	...	...	...	...	...	...	24	62	82	148	165		
Castings & other uses	45	52	48	65	81	49	53	111	120	139	121		
Total	519	581	557	757	903	537	634	1,014	1,061	1,126	1,206	1,275	1,450
Added to Government stockpile									Avg. 72	Avg. 150	65		
Avg. price of lead at New York (¢ per lb)	4.14	6.92	6.15	7.01	7.47	4.12	5.13	6.16	13.90	15.38	15.14		
Industrial production index 1926 =	58	80	71	85	103	80	109	202	197	244	274		

their increasing impact during the past twenty years has been included in this tabulation. All market prices and cost figures are shown as the U. S. equivalent at then prevailing rates of exchange, see Table IV. The tabulation includes data derived from annual reports of only those companies from whose statements the cost of lead-zinc production is readily obtainable.

Over a period of twenty years it will be recognized that the percentages of total production in any one country available for statistical analysis with regard to lead and zinc will vary. For example, in U. S. the percentage of total lead produced varies from 55% in 1936-39 to 36% in 1951-54. During

Table III. World Mine Production of Recoverable Lead

(Thousands of short tons)

	Avg. 1913–14	Avg. 1915–18	Avg. 1919–21	Avg. 1922–24	Avg. 1925–29	Avg. 1930–35	Avg. 1936–39	Avg. 1940–45	Avg. 1046–50	Avg. 1051–54	1955	Est. 1956	Est. 1960	Est. 1975
U. S.	485	567	439	539	673	358	406	444	389	359	333	341	325	300
Latin America														
Mexico	51	53	82	158	245	197	258	206	225	251	232	235		
Argentina	...	...	2	1	4	4	21	25	22	24	26	29		
Bolivia	1	2	3	11	18	10	17	13	22	28	21	20		
Peru	6	3	1	1	21	12	49	53	60	111	123	120		
Others	...	...	...	...	...	...	1	1	3	6	4	10		
Total Latin Amer.	58	58	88	171	288	223	346	298	334	420	406	414		
Br. Commonwealth														
Canada	19	22	24	64	151	151	201	212	189	185	202	247		
Newfoundland	...	...	...	...	3	29	31	28						
Australia	253	197	63	178	211	230	287	251	218	265	309	320		
Burma	10	17	41	68	100	83	86	25	2	7	16	13		
South Africa incl. Rhodesia	10	4	22	33	27	8	18	14	36	67	99	104		
United Kingdom	22	14	10	11	17	40	33	5	3	6	7	7		
Other (India)	...	...	...	...	...	...	...	...	1	2	3	2		
Total Br. Common	314	254	160	354	509	541	656	535	449	532	636	693		
Far East (incl. China, Japan, Korea)	4	11	4	3	4	10	25	27	9	21	32	39		
Western Europe														
*Austria	27	36	4	6	8	7	3	...	3	6	5	6		
France	8	3	6	8	8	5	6	5	10	12	9	10		
Germany	83	80	55	36	60	60	89	72	31	64	74	80		
Greece	20	9	2	5	6	7	5	1	2	6	6	4		
Italy	30	24	30 (S)21	23	34	25	41	25	31	46	53	60		
Spain	201	182	137	140	150	95	34	37	36	51	67	60		
Sweden	2	2	1	2	5	7	10	14	25	27	36	40		
Total W. Europe	371	336	235	220	271	206	188	154	138	212	250	260		
Eastern Europe														
Czechoslovakia	...	...	...	...	7	4	4	2	6	23	...	...		
*Poland	...	...	1	11	14	8	4	1	17	...	24	24		
Rumania	...	...	...	...	...	3	7	...	5	...	4	4		
Yugoslavia	...	...	4	8	13	55	84	14	68	90	99	95		
USSR	2	1	1	1	3	22	66	82	98	186	255	229		
Total E. Europe	2	1	6	20	37	92	165	99	194	299	382	352		
Africa (ex Br. Com.)														
Algeria						3	4	1	1	7	11	12		
Fr. Eq. Africa						...	...	4	2	4	4	4		
Fr. Morocco	18	15	16	33	38	8	19	13	33	87	98	100		
Tunisia						10	13	9	15	26	29	32		
Other						9	7	2	1	...	...	...		
Total (Africa ex Br.)	18	15	16	33	38	30	43	29	52	124	142	148		
Other	...	...	...	...	...	...	6	...	1	...	1	1		
Total world	1,252	1,242	948	1,340	1,820	1,460	1,835	1,586	1,566	1,967	2,182	2,248	2,250	2,300

(S)—Smelter production.
*—1938–1945, Austria included with Germany.
1940–45, Poland included with Germany.

1913–1929, Europe, Africa ex Br. Emp., India—Int. control in non-ferrous metals.
1930, Europe, Africa ex Br. Emp., India—ABMS.

1936-39 the annual production-cost data of Federal Mining & Smelting Co. were included in the 55% of total U. S. production covered in the tabulation. By 1953 Federal Mining had been absorbed into the corporate set-up of American Smelting & Refining Co. and its production-cost data were no longer available for analysis. Likewise, in Australia the annual data of Zinc Corp. is now contained within the overall structure of Imperial Smelting Corp., thus becoming unavailable for inclusion with other Australian companies.

Some producers of large tonnages of lead-bearing ores are excluded from the above table where tha production of copper or of other metals is a more important consideration in company affairs than is the production of lead. Among such companies are Anaconda, in U. S., and Cerro de Pasco, in Peru. Such companies are important in the world total mine production of lead but they are not directly comparable on a cost basis with the eleven companies included in the above tables. However, if Cerro de Pasco were considered as a lead-zinc producer with by-product revenue from all other products including copper, gold and silver credited against the cost of production of lead and zinc, its cost per pound of metal recovered would have been as shown in Table V.

On the basis then of considering Cerro de Pasco as a lead-zinc producer with additional income derived from other products our total may be expanded to twelve companies in seven countries.

It will be noted that 1955 cost figures are generally below those shown as an average for the period 1951-54. During the period 1951-54 the prices of lead and zinc respectively soared to 19.00c and 19.50c in U. S. during the Korean episode. These were ceiling prices. At the same time prices in the United Kingdom reached 22.50c for lead and 23.75c for zinc (U. S. equivalent). From these high points the price of lead and zinc dropped to lows of 12.50c and 9.25c respectively in U. S. and 10.00c and 8.70c respectively in London (U. S. equivalent) during 1954 and some accumulated stocks were sold at such comparatively low prices. For mining companies generally both the Korean period and the year 1954 were periods of relatively high costs. 1955, on the other hand, was a year in which considerable accumulated stocks and large

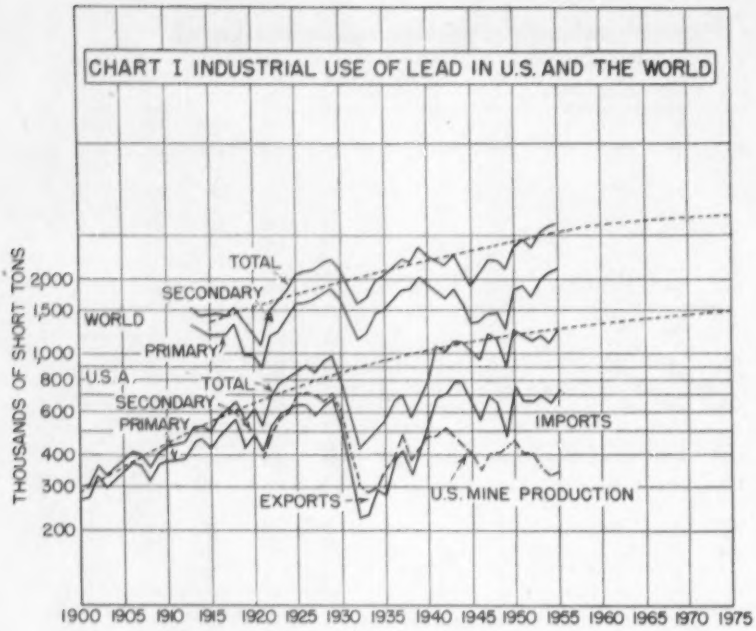


Table IV. Operating Costs of Various Lead and Zinc Mining Companies in Six Countries

	Avg. 1936–39	Avg. 1940–45	Avg. 1946–50	Avg. 1951–54	1955
Various U. S. companies[1]					
Total costs per pound of metal produced—					
Before taxes	4.03c	5.31c	8.47c	8.29	7.68c
After taxes	4.18	5.80	9.87	10.23	10.02
[1]Representing, of U. S. total mine production of lead, 55% in 1936–1939 and 36% in 1951–1954 and 41% in 1955.					
One Canadian company[2]					
Total costs per pound of metal produced—					
Before taxes	2.20	2.33	2.72	6.71	4.95
After taxes	2.56	3.00	5.47	9.51	7.73
[2]Representing 80%–90% of Canada's total mine production of lead.					
Two Mexican companies[3]					
Total costs per pound of metal produced—					
Before taxes	2.50	5.30	9.42	10.97	7.45
After taxes	2.62	6.08	11.25	14.01	10.96
[3]Representing, of Mexico's total mine production of lead, 21% in 1936–1939, 20% in 1951–1954, and 23% in 1955.					
Various Australian companies[4]					
Total costs per pound of metal produced—					
Before taxes	2.88	3.90	11.44	11.48	8.59
After taxes	2.99	4.26	12.56	12.89	9.63
[4]Representing of Australia's total mine production of lead, 69% in 1936–39, 53% in 1940–45, 81% in 1946–50, 44% in 1951–54, 42% in 1955.					
Two South African companies[5]					
Total costs per pound of metal produced—					
Before taxes[6]	....	....	4.75	4.51	4.56
After taxes	....	....	8.00	7.92	6.65
[5]Representing, of South Africa's total mine production of lead, 42% in 1946–50 (one company), 90% or over in 1951–54 (two companies), 84% in 1955 (two companies). [6]After crediting large by-product revenue derived from vanadium and copper.					
One Argentine company[7]					
Total costs per pound of metal produced—					
Before taxes	2.95	6.28	11.05	7.69	8.95
After taxes	2.95	6.37	11.90	10.49	10.33
[7]Representing over 85% of Argentina's total mine production of lead.					

Table V. Cost per Pound of Metal— Cerro de Pasco Corp.

	Avg. 1940–45	Avg. 1946–50	Avg. 1951–54	1955
Total costs per pound of lead and zinc produced—				
Before taxes	2.58c	9.16c	8.62c	5.79c
After taxes	3.63	11.32	10.59	7.82

production were disposed of at general rising prices.

Apart from Europe and USSR, for which production-cost figures are not available, the countries which possess the greatest reserves of lead-bearing ores rank about as follows with reference to 1955 operating costs. The lowest cost countries are listed first.

Lead Producers in Order of Present Operating Costs

Before taxes	After taxes
1. South Africa (lowest)	1. South Africa (lowest)
2. Canada	2. Canada
3. Peru	3. Peru
4. Mexico	4. Australia
5. U. S.	5. U. S.
6. Australia	6. Argentina
7. Argentina	7. Mexico

The tax "bite" per pound of metal produced in 1955 was highest in Mexico at 3.51c per lb of metal and lowest in Australia at 1.04c per lb of metal.

On the basis of present indications the countries best situated for increased production in the future, having in mind both operating cost and tonnage of ore reserves, are South Africa, Canada and Peru. Reduction of Mexico's present very high tax bite of 3.51c per lb of metal in 1955 would materially improve possibilities in that country. It is also likely that USSR will register some increases.

In the foregoing study of operating costs and taxes there are included operating results of twelve major companies producing lead and zinc in seven countries. Based on the average market prices in 1955 (lead and zinc combined) of 13.69c per lb in U. S. and of 12.28c per lb in London (U. S. equivalent), taxes on profits and other costs in the mining industry outside U. S. and in U. S. in 1955 were per pound of lead and zinc as shown in Table VI.

Prospective Price of Lead

Chart II presents, on an annual average basis, the price of lead per pound in U. S. (1913-1955) and at London (1923-1955), during which periods there have been wide price fluctuations—from a low of 3.18c per pound (average) at New York in 1932 to a high of 18.04c per pound (average) in 1947. The London price has registered even wider variation from low to high. It may be remembered, however, that the period shown includes the two world wars and the Korean episode, the great depression of the 1930's and the devaluation of the dollar to 59% of its pre-depression value.

On Chart III there is shown a combination of the Index of Industrial

Table VI. Taxes Levied on Major Mining Companies

(Based on 1955 metal prices and Costs Per Pound of Lead and of Zinc)

	Taxes	Costs Before taxes	Costs After taxes
Mexico	3.51c	7.45c	10.96c
Canada	2.78	4.95	7.73
South Africa	2.09	4.56	6.65
Peru	2.03	5.79	7.82
Argentina	1.38	8.95	10.33
Australia	1.04	8.59	9.63
Simple average ex-U. S.	2.14	6.71	8.85
U. S.	2.34	7.68	10.02

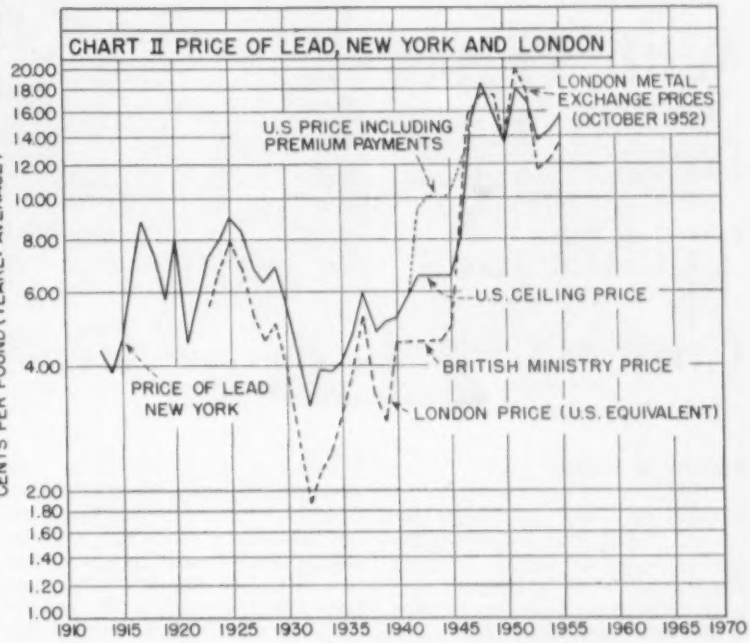
Production (Federal Reserve Board) and the Index of Wholesale Prices (Bureau of Labor). Both are taken at 1926 equal to 100. They are combined in order to obtain an index of the dollar value of commodities flowing into industrial use. To this combined index there is compared the annual volume of lead flowing into industrial use within the U. S. multiplied by the annual average price of lead. The two lines show a high degree of correlation. See Table VII.

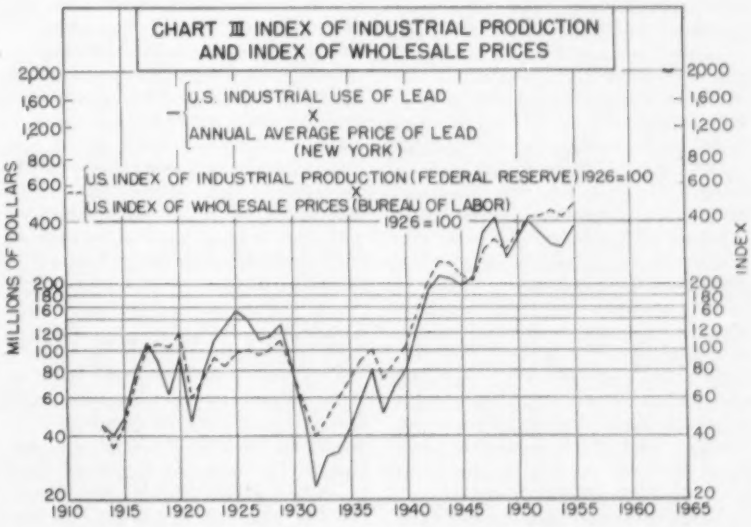
Since lead is an industrial metal entering into a great variety of uses, it is to be expected that the use line of lead would closely parallel the line of industrial production; it is perhaps not so widely appreciated that the U. S. annual lead bill, the amount that industry pays for the lead it uses, has so closely paralleled the index of what industry has paid for all its raw materials. It would seem that from 1913 to 1955 the volume-price of lead was moderately above its station only during 1923-1929 and 1947-1948. Otherwise it has seemed rather to lag behind the average of other industrial commodities.

The trend of the two lines has been sharply upward since the beginning of World War II, a period of only sixteen years on which it would be hazardous to base a long-term projection into the future. However, a continuing moderately upward trend in industrial production with the general average of commodity prices tending to stabilize at present levels would be sufficient to raise the Industrial Production-Commodity Price Index to the 600 level by 1975. If we may assume that the volume-price of lead will continue its present correlation with the Industrial Production-Wholesale Price Index, we may expect that by 1975 U. S. industry will be purchasing lead to the tune of $450-million to $500-million a year. Since the anticipated U. S. industrial use of lead at that time will be about at the level of 1,450,000 tons per year, a price level of 15.00 to 17.00c a pound should be in order.

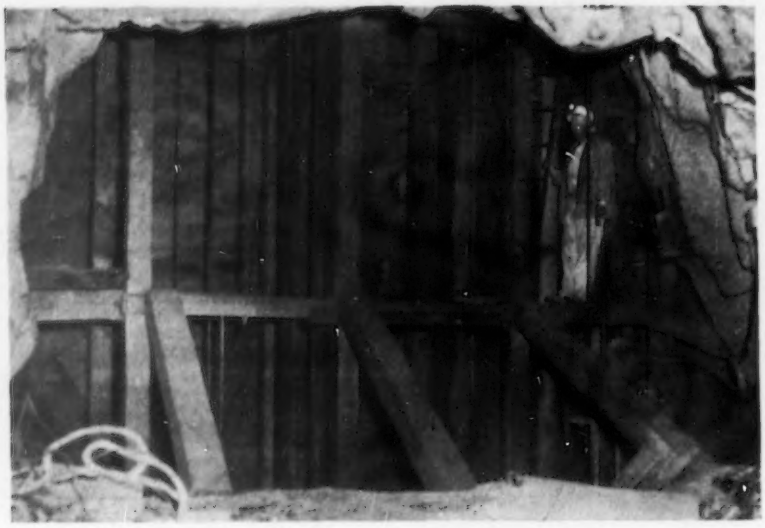
Table VII. Correlation Shown on Chart III

	U. S. Index of Ind. Production (102610 = 0)	U. S. Index of Commodity Prices (1926 = 100)	Combined (Chart III)	U. S. Ind. Use of Lead (Short tons)	U. S. Av. Price Pr. Lb Lead (Cents)	Combined (Chart III) (Dollars)
1913	64.8	69.8	45.2	510	4.370	44.574
1920	78.6	154.4	121.4	605	7.957	96.280
1930	96.0	86.3	82.8	769	5.517	84.851
1940	131.0	78.7	103.1	782	5.179	81.000
1950	220.0	158.8	349.4	1,211	13.296	322.029
1955	272.0	170.5	463.8	1,206	15.140	365.177





Thus, there seems in prospect a prolonged period of relative price stability. Over such a long period as twenty years there are bound to be times of shortage and of over-supply in the world lead market, just as there have been such times in the past. In the particular case of lead, such divergencies from normalcy have proved to be both moderate in scope and of short duration. There is no presently apparent reason to anticipate any different pattern over the next twenty years.



PRESTRESSED wallplate makes concrete set that is long-lasting, low-cost and of small mass. Blocking is concrete block.

With These New Techniques Concrete Sets Prove Practical

ROBERT A. ELGIN

WITHIN THE PAST FEW YEARS, prestressed concrete has been rapidly gaining recognition. In this structural material, advantage is taken of high compressive strength of concrete while at same time overcoming its low tensile strength by putting the entire structural member under compression with special steel rods, wires, or cables. It has advantage of producing a structural unit with about half the concrete and one-third the steel employed in ordinary reinforced concrete. Furthermore prestressed concrete usually employs only 15 to 20% of steel used in structural steel design. This was made possible by development in very recent years of high tensile rods, wires and cables. First development of steel for prestressed concrete was in form of wires and cables. In 1951, however, high tensile steel bars were introduced in United States. This steel, with ultimate strength of 145,000 psi and yield stress of 130,000 psi at 0.7% elongation, was developed by Donovan H. Lee and McCall's Macalloy, Ltd., of England, and is manufactured in U. S. by Stressteel Corp.

About two years ago, Banner Mining Co., Lordsburg, N. M., asked Elgin Co. about feasibility of using Elgin's pre-formed, pre-stressed structural units to replace timber sets in their three compartment Bonney Shaft, principal means of access to their underground mining operations. Purchase of adjacent Miser's Chest property, followed by connection a year or so later with Miser's Chest shaft, had resulted in ventilation of Bonney Shaft becoming upcast. Warm air, together with high relative humidity, had decayed shaft timber to such an extent that it was necessary to re-timber entire shaft as quickly as possible. Problem was more difficult since it was necessary to keep shaft open at all times for hoisting and lowering of two working shifts each day, six days a week.

A tentative agreement was made between the two companies that if an all-concrete set could be successfully designed, a hundred foot section of shaft would be reconditioned on a cost plus 10% basis.

Wall Plate Was Key in Design

Prestressed members that Elgin was then manufacturing were not suitable as a replacement for timber sets, so an all-concrete shaft set was designed. Two principal problems were to design a concrete set that would not be too heavy to handle and one that could be installed by ordinary shaft crews with no previous experience. Key to problem was design of wall plates, since they were longest structural members. Only known answer to requirement of a comparatively light-weight assembly combined with high strength was prestressed concrete. Posts, dividers, and end plates were short enough to offer no particular weight problem, and did not require special steels or processing. Concrete sets were designed almost exactly like the conventional wood sets which they replaced, only of smaller cross-section.

It was determined that 5- by 6-in. wall plate with single ⅝-in. Stressteel rod in center would fulfill requirements. Since dead loads and shock loads to which plates might be subjected could come from any direction, single center rod was believed to be most efficient.

Wallplate Was Prestressed

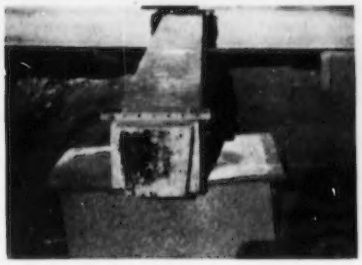
Wall plates were cast 6 in. wide and 5 in. deep and were recessed (notched) 1 in. at four points along their length where they were intersected by end plates and dividers. Divider recess was dovetail. Longitudinal center hole for ⅝-in. Stressteel rod was 1-in. dia, offset slightly toward outside edge so wall plate formed small arc when fully stressed. Purpose of this was to insure that dividers were tightly compressed when set was assembled. There were two horizontal holes at each end for bolting angle iron to hold end plates, two vertical holes at each of points at which posts would rest for reinforcing rod dowels, one horizontal hole adjacent to each divider recess for tie rods, and four vertical holes for hanging rods. In addition, one extra vertical hole was cast adjacent to each pair of hanger rod holes just in case of need, which

Mr. Elgin is a mining engineer of many years' experience. He is now president of Elgin Corp., Silver City, N. M., engaged in manufacture of concrete products.

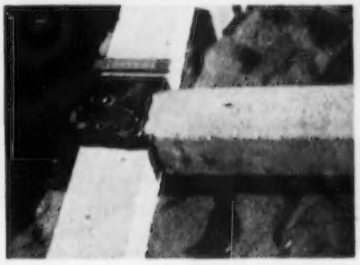
SUCCESSFUL DESIGN gave members of smaller cross-section than with wood.

STEEL PLATE on ends of wallplate is bearing for Stressteel tension rod.

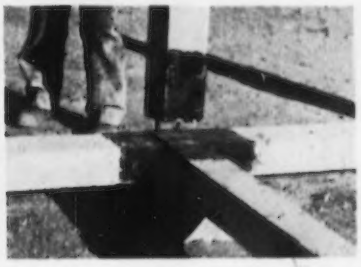
HANGER ROD HOLES were four of 20 cast in wallplate to join frame.



PROJECTING DOVETAIL on divider fitted tightly into recess on wallplate.



PAIRS of smaller holes in wallplate received projecting dowel rods on posts.



ASPHALT roofing compound at joints protected exposed metal from water.

made total of 20 holes in each wall plate.

Posts Were Hollow

Posts were cast 6x6-in. with four ½-in. reinforcing bars and had a hollow core 2 in. in diameter. Hollow core was to reduce weight, since size of posts was much larger than necessary to carry any possible load to which they might be subjected. Two reinforcing rods in each post extended beyond ends and fitted into vertical holes cast in plates to hold them in place. This method of anchoring posts was employed to avoid a larger cross-section of plate by eliminating any recesses.

End Plates Were Simple

End plates were of simple construction, 6 in. wide by 5 in. deep, and were provided with two horizontal bolt holes for fastening piece of angle iron vertically, 1 in. from each end, for bolting through similar holes in wall plates. Dividers were also simple cast members with a dovetail at each end to fit into corresponding recess in wall plates. Both end plates and dividers had horizontal bolt hole for fastening guide channel.

All members except wall plate contained four ½-in, reinforcing rods spaced near four corners. All holes in all members were formed by pieces of thin-wall steel tubing which were accurately spaced while the members were being cast.

When bolts through angle iron fastening end plates to the wall plates were tightened, sets were found to be perfectly square and level. As a further precaution against failure of sets from any cause, two ½-in. tie rods, one adjacent to each divider, securely tied the opposite wall plates to each other.

When it had been demonstrated that all members of concrete sets fitted perfectly and had been assembled with ease at plant site, a contract was made to install sets in section between 400- and 500-ft levels of Bonney Shaft. This section had been chosen because it presented considerable difficulties. Wood shaft sets were in very bad condition and shaft section was considerably oversize in some places. At 500 station two of shaft walls were from six to ten feet distant from outer edge of shaft sets.

To make actual installation, a local group of mining contractors, Brannan, Patten, and Fuller, were given a subcontract. None of the men in the organization had ever had any previous experience with this type of installation. However, there was no difficulty in training crews in technique of handling an all-concrete installation.

Conclusions Promote Wider Use

Conclusions reached after completing work, as described on following pages, are:

1. Prestressed concrete shaft sets are entirely practical. Original installation, now almost two years old, has been completely satisfactory.

2. Shaft contractors estimate cost of installing lightweight concrete sets as being almost exactly same as cost of installing wood sets, and they can be installed by regular shaft crews with very little special instruction or training.

3. Lightweight concrete shaft sets compare very favorably in cost and weight with conventional wood sets and lagging. Slight difference in cost, if any, between wood and concrete installation is far outweighed by advantages of permanency (no decay), safety (no fire hazard), and low maintenance, as well as permitting greater flow of air due to fewer restrictions.

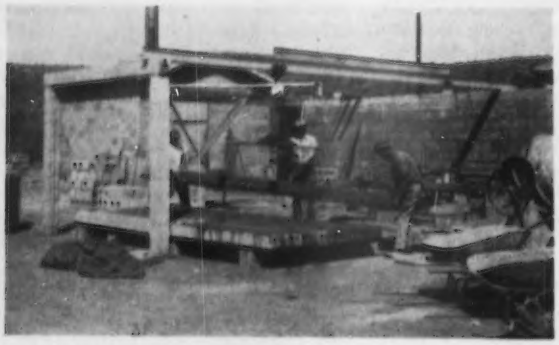
Both United States Bureau of Mines and New Mexico State Mining Bureau have been keenly interested in test section at Banner Mine. Their interest centers around health, safety, and fireproof features of the installation.

A further conclusion, based on experience gained in designing, manufacturing, and installing the shaft sets described, is that it would be simple and economical to design, manufacture, and install tunnel sets that would perform equally well in underground passageways. Mining engineers should give thought to this latter development, for it holds much promise.

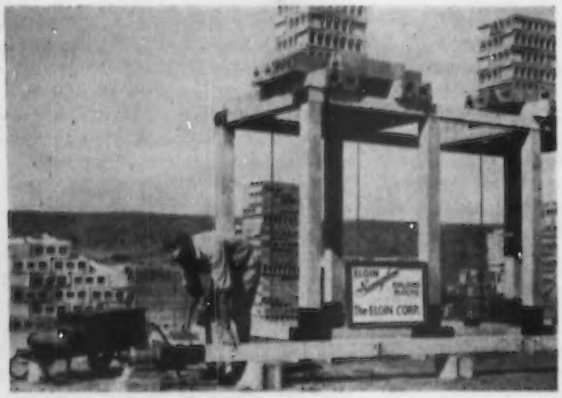
CASTING BED consisted of four concrete block piers to which were fastened various structural steel form-members.

BLOCKING for sets was prefabricated of hollow concrete block, with mortared joints and grouted bolts in small holes.

IMMEDIATELY after casting, front channel is removed.



BOTTOM channel serves as pallet for moving fresh member.



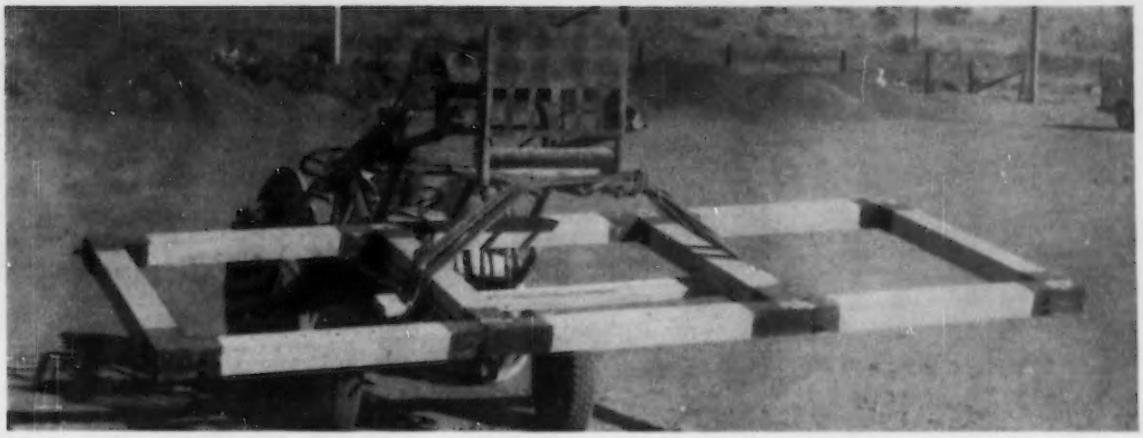
HYDRAULIC jack tensions center rod in long wallplate.

Making Members Is Simple

Special casting bed for all structural members was of simple design. It consisted of four concrete block piers each topped by securely anchored short piece of 4-in. "I" beam. At back end of "I," short piece of 2½-in. angle was fastened vertically. Standard 8-in. channels, 15 ft long, rested across "I's" to make bottom of form and after casting served as pallets. A 5-in. channel, bolted to upright angles, formed back of mold box. This channel was located just high enough to permit sliding bottom 8-in. channel under its lower edge. Front of form was another 5-in. channel which rested on near edge of 8-in. pallet. Two sides of forms were held in place by steel templates that were used for spacing various holes and recesses.

All members were made of high early strength cement and were dense concrete weighing 150 lb per cu ft. Seven-sack per cu yd mix was used with minus 7/16-in. gravel and sand. Water was minimum, giving about 1-in. slump. Ordinary one-sack, drum-type mixer was used. Concrete had minimum compressive strength in excess of 5,000 psi in 28 days. Concrete was tamped into molds using electric vibrator. Fitted into vibrator was ⅝-in. rod which had slightly curved ¼x1½x3-in. plate shoe at other end. As soon as mold was full and concrete was properly compacted and troweled smooth, pipe forming center hole was removed. Next, templates were removed leaving short tubing in holes; then outside 5-in. channel. Finally bottom 8-in. channel was then slid forward. This had effect of removing back channel and left cast member resting on 8-in. pallet. Freshly formed member was then transferred by a trolley chain hoist to a storage pile for curing. At end of shift, all freshly cast members were covered with a tarpaulin and live steam turned on under the canvas. Next morning concrete had attained sufficient strength for handling and storage. Long wall plates, inasmuch as they contained no reinforcing steel when cast, could not be removed from the pallets until they had been partially prestressed.

Before Stressteel rods were inserted into center longitudinal hole, they were given heavy coat of asphalt roofing compound, and pad of roofing felt was placed on each end between the concrete and the 4x4x¾-in. plates provided for prestressing. Pull of 10,000 lb was given Stressteel rods by means of a hydraulic jack made for that purpose. Tension on rod and resultant compression of concrete was sufficient to permit handling of the plates without damage. Final tensioning of rod to 30,000 lb was made after 28 days. It was calculated that an initial tension of 30,000 lb would result in a permanent tension of 26,000 lb after shrinkage and plastic flow of concrete had ceased. Purpose of asphalt coatings on Stressteel rods and all exposed metal was to protect against moisture. Water in the Bonney Shaft was quite corrosive.



RIGID, assembled ring weighs 1,610 lb when made of standard 150-lb concrete, 1,336 lb when of lightweight concrete.

Installation Was Efficient Operation

Bonney Shaft, at time concrete shaft sets were installed, was 1440 ft deep. Upper levels had been worked out, however, and all mining operations were in vicinity of 1200-ft level and below. Shaft consisted of three compartments 48-in. by 55-in. in clear. Outside dimensions were 5 ft 11 in. by 14 ft 8 in. Two of compartments were for hoisting, and third contained manway, air lines, water lines, and an electric armored cable. Sets were lagged all around, Coeur d'Alene style. In section in which installation was made, sets had decayed to such an extent that end plates and posts in some instances had fallen out and ladderways were not usable. Most of sets had dropped down six or eight inches at one end or the other, and were far from being level or in alignment.

Just before work was started on new installation, concrete bearers 8 in. wide and 24 in. deep had been placed at 100-ft intervals by Banner Mining Co. Old timber bearer sets had become worthless and there was danger of collapse of sections of the shaft. This was not any fault of the company, but was due to rapid decay of timber sets when ventilation became upcast.

Several problems had to be decided before sets were installed. First two problems had to do with blocking sets and with lagging off sides. After careful consideration by E. S. Bowman, president of Banner Mining Co., and Alan Bowman, manager of their Tucson operation, it was decided to make test section entirely of concrete and steel. Only guides were to be of wood to comply with State mining laws where men are hoisted and lowered. It was decided to use wire mesh and to rock-bolt walls of shaft where necessary. This was to be followed by Guniting entire section when completed. All blocking was to be concrete; ladders, steel; and landings, steel grating. Manway was to be screened off from hoisting compartments by galvanized steel mesh to protect against falling rock or spillage from above.

Tried Prefab Bearer

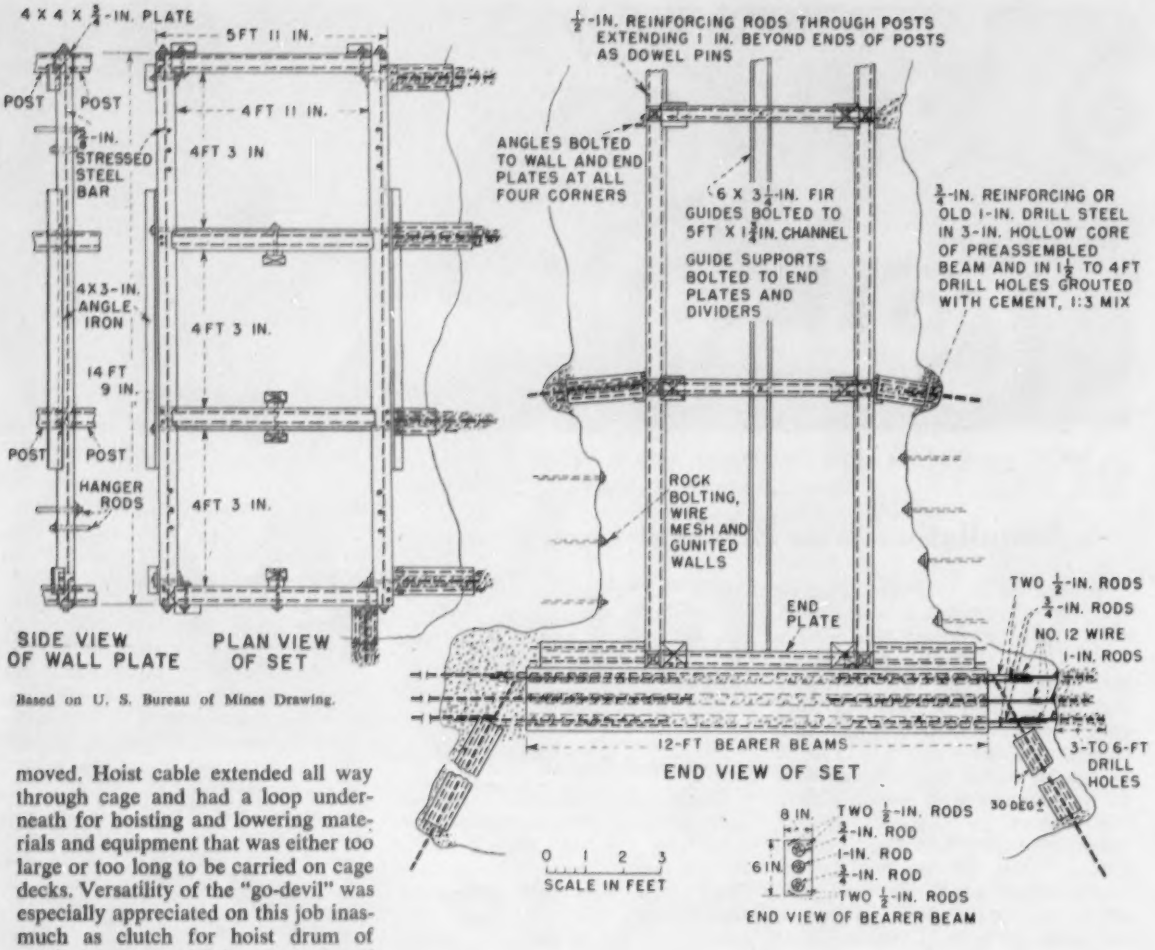
Concrete bearers had not been previously placed at 500-ft level to compare time and cost of placing precast bearers against casting them in place. Deep hitches were cut at each end of four bearers, and 3- to 6-ft holes drilled into end of hitches to receive reinforcing steel. Pre-assembled, prestressed bearer beams, made of 8x8x 16-in. concrete masonry blocks were lowered into position, leveled and tied in with steel in hitches as shown in drawing on next page. U-shaped pieces of sheet metal served as forms joining ends of bearers to hitches. Next forms were filled with high early strength concrete which was well rodded to fill the holes around the rods, as well as all exposed crevasses. Ground sloped away from shaft sets so sharply at one end of bearers that it was necessary to place concrete block knee braces as an additional support. (See drawing and photos.) These prestressed block bearers were entirely successful, but we do not believe any saving was made in either time or money over monolithic cast-in-place, so they are not described in further detail.

Since walls of the shaft were to be rock-bolted and Gunited, it was not necessary to have sets at close intervals. Timber sets to be replaced were on 5-ft vertical intervals, but it was decided that concrete sets at 7½-ft intervals would be satisfactory. To give rigidity to guides and make it easier to repair or replace them as needed, 5-in. channels were folded to dividers from top to bottom of concreted section, and guide, in turn bolted to channels.

Originally it was not known whether method of blocking sets would make each set self-supporting. Since total weight of each set when completed would closely approximate 4,000 lb, there was some question whether hanging rods would carry weight of sets until they reached bearer sets below. It was therefore decided that this original section would start at bearer sets and be built upward to bearer sets approximately 100 ft above. Since timber sets were not self-supporting, it was necessary, each time a concrete set was installed, to support set immediately above with steel cables which were dropped down sides of shaft from anchor bolts some distance above. Timber was in such bad condition that steel plates were required under sets in lower section to keep cables from cutting them in two.

Working Cage Was Ingenious

Bearers from which work started were about 14 ft below 500-ft level station. Shaft section was so wide at station that it was impractical to try to locate bearers at that point. All work was done from decks in hoisting compartment and platforms in manway compartment. In end compartment, deck was just above two-deck cage. Suspended below cage in center compartment was an ingenious working cage called a "go-devil," designed and built by Phelps-Dodge Corp. and loaned for this work. This working cage was a lightweight framework consisting of vertical angles at four corners which enclosed two platforms about 10 ft apart. Top and bottom ends of angle iron framework sloped inward to form runners so that cage could be hoisted and lowered in compartment even when guides were re-


4 X 4 X ¾-IN. PLATE
5FT 11 IN.
POST
POST
4FT 11 IN.
¾-IN. STRESSED STEEL BAR
4FT 3 IN
4X3-IN. ANGLE IRON
4FT 3 IN.
14 FT 9 IN.
POST
POST
HANGER RODS
4FT 3 IN.
SIDE VIEW OF WALL PLATE
PLAN VIEW OF SET
½-IN. REINFORCING RODS THROUGH POSTS EXTENDING 1 IN. BEYOND ENDS OF POSTS AS DOWEL PINS
ANGLES BOLTED TO WALL AND END PLATES AT ALL FOUR CORNERS
6 X 3½-IN. FIR GUIDES BOLTED TO 5FT X 1¾ IN. CHANNEL
GUIDE SUPPORTS BOLTED TO END PLATES AND DIVIDERS
¾-IN. REINFORCING OR OLD 1-IN. DRILL STEEL IN 3-IN. HOLLOW CORE OF PREASSEMBLED BEAM AND IN 1½ TO 4FT DRILL HOLES GROUTED WITH CEMENT, 1:3 MIX
ROCK BOLTING, WIRE MESH AND GUNITED WALLS
END PLATE
TWO ½-IN. RODS
¾-IN. RODS
NO. 12 WIRE
1-IN. RODS
12-FT BEARER BEAMS
END VIEW OF SET
3-TO 6-FT DRILL HOLES
30 DEG±
8 IN.
TWO ½-IN. RODS
¾-IN. ROD
1-IN. ROD
6 IN.
¾-IN. ROD
TWO ½-IN. RODS
END VIEW OF BEARER BEAM
0 1 2 3
SCALE IN FEET

Based on U. S. Bureau of Mines Drawing.

moved. Hoist cable extended all way through cage and had a loop underneath for hoisting and lowering materials and equipment that was either too large or too long to be carried on cage decks. Versatility of the "go-devil" was especially appreciated on this job inasmuch as clutch for hoist drum of north cage was rigidly engaged and did not permit independent movement of cage.

Station Gave Problem

Installation of first three sets was especially difficult due to oversize cross-section of shaft and large amount of old timber that had to be removed. Photograph of 500 level station, at beginning of this article, shows extremely long side and end braces that were required. Other photographs show preassembled concrete masonry blocking units. Drawings show more details.

As each set was assembled in place, it was tightened vertically with hanging rods, and transversely with tie rods and end plate bolts. Usually the sets were found to be very close to alignment at this stage, but temporary wood blocking was placed as insurance against shifting while working on top of set. Twelve holes were next drilled with a downward slope from the top of set for anchoring masonry blocking, two at each corner, and one at each end of each divider. These holes were usually about 18 in. deep, but in places where rock slabs could drop and release blocks, holes were made deeper. A section of ¾-in. reinforcing steel was inserted in each hole and projecting end was bent down slightly so that it would come approximately opposite center of wall plates. Some old 1-in. drill steel was used at first but was not very satisfactory since it could not be bent.

Blocking was manufactured from 8x8x8-in., 3-in. hollow core concrete cinder blocks which also had ¾-in. holes cast near each bottom edge and down center of top side. In length, therefore, they were in multiples of eight inches. Required blocks were assembled with mortared joints and then each assembly was made by placing ⅜-in. dia reinforcing rods through the ¾-in. holes, tensioning with a torque wrench, and grouting the rods in place while under tension. When cement grout was cured, rods became an integral part of assembly, as in conventional cast concrete. Cut washers welded to rods approximately 6 in. from one end left this portion of rods protruding after blocking was manufactured. Other ends of rods were threaded for nuts so they could be tensioned with torque wrench. Large cast washers gave bearing. After sufficient time for curing grout, nuts and washers were removed from threaded ends. These rod ends were cut off flush with end of assembly.

Blocking Was Grouted

Block assembly was laid in place by inserting ¾-in. reinforcing steel (previously placed in hole in rock wall of shaft) into hollow core, and placing other end on 3x4-in. angle iron previously bolted to set (see drawing). Blocking, when in place, was pointing downward with protruding ends of ⅜-in. reinforcing rods toward rock wall. A U-shaped piece of sheet metal was wired to block to close gap between block and wall. Clearance for mortar around ¾-in. rod inserted into center of block assembly was maintained with small chip of rock or wood.

A mortar mix consisting of three parts of coarse sand to one part high early strength cement was used to ce-

PREFABRICATED test bearer, left, of 8 x 8 x 16-in. concrete blocks tied together with ½-in. steel grounted in holes, proved satisfactory but showed no advantage over cast in place beams. All blocking, including extra-long ones in left photo, were of similar block construction. Rock bolts and Gunite were used on walls, see right.

ment blocks in place. Mortar was compacted by hand in sheet-metal form, and squeezed into hollow core of block assembly as far as practical, and into hole in wall of shaft which held ¾-in. reinforcing rods. Mortar was also packed into wedge-shaped gap between shaft set and near end of blocking. This procedure gave complete contact at both ends of block with ground and with shaft set.

Curing conditions were ideal—moist, warm air and even temperature—so concrete was quite hard within 24 hours. Even at this stage of operation, downward slope of blocking and firm bearing at both ends made shaft set self-supporting. Later, when this section of shaft was Gunited, blocking was so firmly attached to shaft set and to rock wall that it appeared impossible to remove one of blocks without destroying it completely. In no instance was a block loosened or broken during the course of operations, although falling rocks and timber often gave sets and blocking severe blows. Unlike wood blocking, which has only partial contact at each end, and tends to loosen or decay in normal operations, concrete blocking will never loosen during the life of shaft.

Rock Bolts And Guniting Used

Rock bolts were placed wherever need was indicated. In some sections where rock was fractured and had a tendency to break into small pieces, galvanized wire mesh was anchored to the walls by rock bolts. Some of sets required no rock bolts and other sets required quite a few. Average number for each set was about six.

After all sets were in place, Gunite machine was lowered to a platform in manway compartment below 400 level bearers. Dry cement-sand mix was made at collar of shaft and lowered to Gunite machine in a shaft bucket suspended below cage. Shaft bucket had been equipped with an inclined bottom and a chute gate by shop crew at mine and easily kept Gunite machine supplied. Gunite was applied to an average thickness of ½ in. Operation was completed in about 24 hours.

Following Guniting, steel ladders, steel landings, and galvanized wire mesh between manway and hoisting compartment were installed. Temporary wood guides were replaced by new guides which were bolted directly to 5-in. steel channels mentioned previously.

Lighter Sets Are Possible

Weight of sets, while no major obstacle, can be reduced. At time original sets were designed Elgin had no assurance that concrete with required strength density and toughness could be produced with lightweight aggregates. However, producers of lightweight aggregates for concrete have been making rapid progress in developing material of this type and it is now available in most mining areas. Featherlite Corp. of Austin, Texas, produces a lightweight, expanded shale aggregate that is guaranteed to make 6,000 psi concrete with a weight not to exceed 100 lb a cubic foot. By using this lightweight concrete, objectionable feature of concrete sets—their weight—will be overcome.

Elgin's Costs Are Reasonable

Concrete sets (complete with 8 posts)	$175.00
Concrete masonry blocking (24 ft ± @ $1.25 per ft), per set	30.00
Cuniting (labor and materials), per set	34.00
Average total cost per set (7½-ft interval)	$239.00
Cost per ft of shaft	$ 31.87
Lightweight concrete set (complete with 8 posts)	$187.50
Cost per ft—lightwt. sets; blocking and Guniting as above	$ 33.53

Shaft Contractor's Labor Estimates Are Interesting

Taking out old timber and replacing with wood sets @ 5-ft interval blocking and lagging, per ft	$ 39.50
Taking out old timber and replacing with lightweight concrete sets @ 7½-ft interval using concrete blocking and Guniting walls, per ft	$ 40.00
Installing lightweight concrete sets in new section of shaft @ 7½-ft, using concrete blocking and Guniting walls, per ft	$ 25.00
Rock bolting walls as needed, per bolt	$ 1.50

Note: Figures do *not* include cost of construction material, add $22.40 per ft ($112.00/5) for untreated wood set lb,ocking and lagging or add $33.53 per ft ($187.50-/7½) for lightweight concrete sets, masonry blocking and Guniting.

Following table shows comparative weight of various members when made of heavy (150 lb per cu ft) concrete and when made with lightweight aggregates:

Member	150-lb	100-lb
Wall plates	475 lb	317 lb
End plates	167 lb	111 lb
Dividers	163 lb	130 lb
Posts	250 lb	167 lb

This reduced weight gives high strength concrete sets which closely approximate weight of wood sets which they replace. Inasmuch as a cubic yard of aggregate is more than enough for each set, cost of shipping aggregate to point of manufacture is not an important factor.

Costs Were Low

No cost figures are available on items furnished by Banner Mining Co., such as Gunite machine, rock drills, rock bolts, steel ladders, steel landing, galvanized wire mesh, etc. But costs of items furnished by Elgin Corp. are given in tables above. Costs for lightweight concrete sets are given too. And there is also an estimated cost table submitted by shaft contractors who rehabilitated entire Bonney Shaft.

MOVING 35,000 to 40,000 tons of earth a day means that shovels, drills, bulldozers and a fleet of trucks have to be kept in first-rate condition at Consolidated Coppermines open pit, Kimberly, White Pine County, Nev.

How Scheduled Maintenance Keeps Pit Equipment in Top Condition

JOHN B. HUTTL

When Consolidated Coppermines Corp. resumed mining again in July 1955 after contractors had developed open pits and started initial production at the holdings at Kimberly White Pine County, Nev., the company purchased new drills, trucks, shovels and other earth-moving units to replace equipment used by the contractors. The company also got off to a good start by setting up a scheduled maintenance program and providing shops and tools to keep all equipment in top running order. A program was set up to hire and train operators properly. This article tells how this maintenance program is being carried out. But before going into this subject, let's take a brief look at the type of work the equipment has to perform in the field.

The Tripp pit, now under exploitation, is a consolidation of the Morris and Brooks pits. It is oval in shape, the longer axis measuring about 3,500 ft and the shorter 1,800 ft. Access to the different bench levels is via a spiral road system and two switchbacks. Main haulage roads in the pit are established on an 8% grade, though some temporary ramps in the past were as high as 14%. The haulage roads to the waste dumps generally are carried on a 4% grade. All loaded ore and waste trucks operate on an adverse grade.

Drilling and Blasting

The material mined in the pit consists of hard, tough limestone, some of which is ore and some waste, rhyolite, porphyry ore and jasperoid capping. All primary blastholes are drilled with Joy B-H 58 rotaries using 7⅞-in. C-P tricone-type bits and a B-E 40-R rotary drill using 9-in. bits of like make. The holes are drilled to a depth of 31 ft. Drilling speed for the Joys and B-E unit is 48 fph and 52 fph respectively. All 7⅞-in. holes are drilled on 15-ft centers and 15-ft burden, and the 9-in. holes on 18-ft centers and 16-ft burden. They are solidly loaded with bags of Hercules Tritex and 197C and a 25-lb primer cartridge of 50% Extra Dynamite and blasted with Primacord. In some ground millisecond delays are used in the blasting circuit.

Broken material is loaded into 24-ton Euclid diesel trucks by electric and diesel-driven power shovels of different capacities. Five units are available. The two chief production shovels, equipped with 4½-yd dippers, load from 700 to 800 tph. Loading is done against a 25-ft shovel face. Haulage distances vary from 1,000 ft to more than 3,500 ft. Total amount of material mined and moved a day ranges from 35,000 to 40,000 tons, which includes 7,000 tons of ore shipped by rail to the Kennecott concentrator at McGill, Nev., some 25

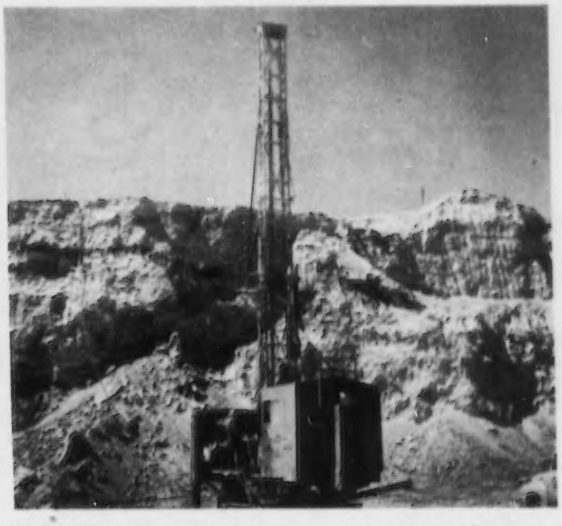
W. J. Latvala, superintendent of open-pit mining operations.

Thomas Gilmour, master mechanic who heads pit equipment maintenance work.

Hugh Rosenlund, assistant master mechanic, pit maintenance department.

Key Men on the Open-Pit Operating and Maintenance Staff

THIS ROTARY drills 9-in. holes with C-P Tricone bits at rate of 52 fph. Model, Bucyrus-Erie, R-40 rotary.



ROTARY DRILL puts down 7⅞-in. C-P Tricone bits at rate of 48 fph. Holes are 31 ft deep. Model, Joy 58 B-H rotary.

miles distant from the open pit mine.

To handle this large tonnage, a fleet of approximately 84 pieces of equipment and four switch houses are needed and kept at work in and out of the pit. Major production units include two Joy B-H 58 rotary drills, one B-E 40-R rotary drill, five power shovels as follows; one P & H 955 2½-yd diesel machine, two P & H electric 4½-yd shovels Model 1400, one B-E 71-B 3½-yd diesel shovel, one B-E 110-B 4½-yd electric shovel and 21 Euclid diesel trucks, Model 63-TD. The trucks have an actual factor of 24 tons per load with side boards.

Among the many auxiliary units in operation are passenger cars and pick-ups for the supervisory staff, 21 pick-up trucks (many with two-way radio systems), one dump truck, two welding trucks, one fuel truck, two water trucks, one grease truck, one powder truck, one dump truck for powder crew use, four dozer tractors, one DW-20 tractor and scraper, two road patrols, one Eimco auxiliary loader, one Michigan turbo-dozer, one portable compressor, one portable light plant, two flat-rack trucks, one wheel-mounted crane and one Model F Euclid truck for use as a tipple truck, plus many other units, making a total of 84 pieces of equipment.

Modern Repair Shops

Proper care of such a large equipment fleet required establishing modern maintenance and repair facilities. The management realized that with well equipped machine, welding, tire and electrical shops, trained crews could virtually do any repair job. The management also insists frequent contact between the supervisory pit personnel and master mechanic, Thomas Gilmour, so as to apprise him of any repair or service jobs that should be carried out without delay to avoid breakdowns of equipment. To broaden this, operators of production units such as drills, shovels, trucks and those of some auxiliary units, are required to turn in a daily card with operating and service data noted thereon. Also, daily lubrication service sheets are made out. Great care is exercised in hiring and training operators, for the saying "a piece of equipment is only as good as the man who operates it" is an ever true one. Truck drivers at

Monthly Maintenance Report (May 1956) Shows How Thoroughly

Equipment	Equip. No.	Air cleaner serviced, times	Air cleaner oil used, qt	Steering oil used, qt	Greased and serviced, times	Tires checked, times	Weekly check	Engine oil added, qt	Engine oil changed, times	Converter oil added, qt
Euclid trucks										
22-ton end-dump										
	301	25	300	3	25	25	1	57	4	7
	302	29	348	20	29	29	1	65	4	15
	303*	—	—	—	—	—	—	—	—	—
	304	25	300	10	25	25	1	33	3	17
	305	31	372	15	31	31	1	49	4	20
	306	6	72	10	6	6	1	6	—	10
	307	29	348	2	29	29	1	69	3	11
	308	24	288	2	24	24	1	44	3	4
	309	29	348	3	29	29	1	77	3	42
	310	29	348	4	29	29	1	66	4	8
	311	5	60	1	5	5	—	9	—	32
	312	29	348	1	29	29	2	65	4	31
	313	30	360	4	30	31	1	43	4	4
	314	30	360	7	30	31	1	92	5	4
	315	29	348	1	29	29	1	43	5	13
	316	31	372	6	29	29	1	58	5	26
	317	16	192	—	16	16	1	30	2	7
	318	30	360	3	30	29	1	56	4	10
	319	29	348	12	29	31	1	36	4	3
	320	29	348	—	29	29	1	29	5	—
	321	29	348	2	29	29	1	40	4	3
Shovels										
P&H 955 2½ yd	202	14	98	—	14	—	—	37	2	—
P&H 1055 3½ yd	203	—	—	—	7	—	—	8	—	—
P&H 1400 4½ yd	204	1	12	—	18	—	—	8	—	—
B-E 71-B 3 yd	205	13	156	—	13	—	—	84	3	—
B-E 110-B 4½ yd	206	4	4	—	12	—	—	5	—	—
Churn drills										
B-E 42T	401	2	8	—	3	—	—	—	2	—
B-E 36L	402	—	—	—	4	—	—	14	4	—
Rotary drills										
Joy 58 B-H	413	19	228	—	21	—	—	—	—	—
Joy 58 B-H	419	24	288	—	24	—	—	—	—	—
B-E 40-R***										

* Did not work all month.

** Hour meter reading somewhat surprising in view of fuel used.

Busy Equipment

◀ **PHOTO AT LEFT** shows the following units at work in one area of the Tripp pit: One P&H electric shovel with 3½-yd dipper, one P&H diesel shovel with 2½-yd dipper, one B-E 71-B electric shovel with 3-yd dipper. Service crane is a P&H rubber-tired model. The truck being loaded is a 22-ton Euclid.

MAINTENANCE SHOPS shown at right include the wash shop (left), welding shop (center) and the garage building (right). ▶

the Scheduled Maintenance Program Is Conducted

Converter oil changed, times	Transmission oil added, qt	Hoist oil added, qt	Hoist oil changed, times	Diff'l lube added, qt	Diff'l lube changed, times	Possible working hours	Hours worked	Total hours on repair	Total standby hours	Total fuel used, gal	Hour meter reading
1	—	300	—	—	—	720	450	44	226	2,575	512
1	6	53	—	—	—	720	680**	40	—	2,768	1525
—	—	—	—	—	—	720	3	24	693	3	4038
—	—	362	—	—	—	720	387	102	231	2,034	0749
1	—	192	1	—	—	720	317	51	352	2,987	0527
1	—	—	—	—	1	720	126	28	566	497	4126
—	—	188	—	—	1	720	398	128	194	2,261	1713
1	—	349	—	—	—	720	420	24	276	2,058	2161
1	—	432	—	—	—	720	451	65	204	2,531	5209
1	—	472	—	1	—	720	523	47	150	2,749	5120
1	—	23	—	—	—	720	105	16	599	1,620	3970
1	—	39	1	—	—	720	557	67	96	3,226	0690
—	—	136	—	—	—	720	559	48	113	3,236	0434
1	—	34	—	—	—	720	574	37	109	3,185	5512
1	—	249	1	—	—	720	593	35	92	3,400	3875
1	—	35	—	—	—	720	605	50	65	3,361	3520
1	—	109	1	—	—	720	248	29	443	1,739	0231
1	—	380	1	—	—	720	558	52	110	3,104	4246
1	—	80	—	—	—	720	577	30	113	3,239	0986
1	—	17	—	—	—	720	582	12	126	3,114	1020
1	—	120	3	—	—	720	567	42	111	3,113	—
—	—	—	—	8	—	—	—	323	—	2,165	—
—	—	—	—	—	—	—	—	227	—	24	—
—	—	—	—	—	—	—	—	263	—	—	—
—	36	—	—	—	—	—	—	271	—	3,551	—
—	—	—	—	—	—	—	—	290	—	—	—
—	2	—	—	—	—	—	—	44	—	256	—
—	—	—	—	—	—	—	—	20	—	217	—
—	—	140	—	—	—	—	—	25	(compressor 286)		—
—	—	—	—	—	—	—	—	21	—	326	—

Using the average shown by this truck in previous months it should be in the region of 553 hr and the meter may be wrong.

*** Unit just placed into operation. No data available yet.

Three Steps in Truck Maintenance

The three photos at right show the following systematic steps taken to service and maintain trucks at Consolidated Coppermines Corp.:

1. Washing. Operator in truck wash shop steam-washes truck from pit with Malsburry steam-cleaning equipment.

2. Inspection and repairing. After washed car has been inspected necessary repairs are made. Photo shows a mechanic welding a repair part for a 22-ton Euclid.

3. Lubrication. Repaired truck is then lubricated. Grease is applied with pneumatic pressure devices.

1. Washing and steam cleaning

REPAIR WORKER removes lock ring from base of rim of deflated open-pit truck tire.

MECHANIC adjusts the piston pin of a 300-hp GMC diesel engine powering the 22-ton Euclid open-pit trucks.

the time of hiring are given a set of operating rules to study and subsequently to abide by.

The repair shops and garages are a short distance from the entrance to the Tripp pit. They comprise four buildings covering a total area of 16,400 sq ft. Building No. 1, measuring 45x120 ft, contains facilities for doing overhaul, inspection, grease and general maintenance jobs on trucks, cars and other equipment. Two 3-ton overhead cranes running the entire length of the building are available to facilitate lifting of parts. Repair tools include portable welders, steel work platforms and others. At one end of the building is a pneumatic greasing installation.

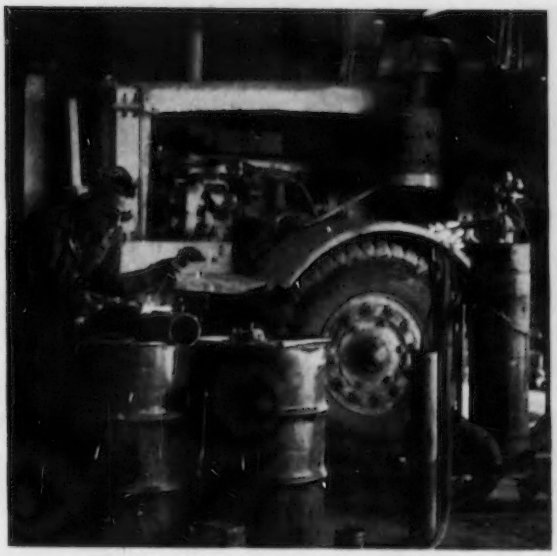
Engine and transmission overhaul, repairs on generators, starters and other electrical auxiliary truck units, adjustment and overhaul of diesel engine injectors, and repairs of sundry small parts are carried out in Building No. 2. It measures 70x80 ft, and is served by two 1½-ton overhead traveling cranes. Engines are tested in a Clayton Universal engine tester. Adjacent to the electrical repair shop is a parts store room.

Units Cleaned With Steam

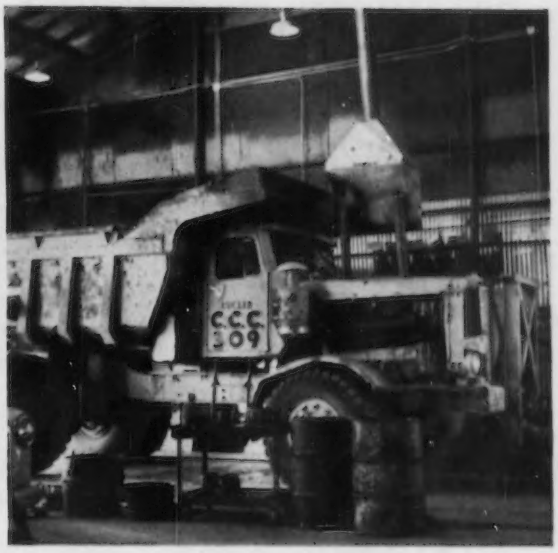
Building No. 3 is 30x72 ft, and houses the welding shop and the truck wash shop which is equipped with a Malsbury steam cleaner. Equipment in the welding shop includes two 300-amp electric welding machines and portable oxygen-acetylene welding units. Tire and body repair jobs are done in Building No. 4, which measures 36x90 ft and contains a ¾-ton monorail crane and a 25-hp I-R compressor. Tire repair is confined to routine checks and small repairs but no recapping is done.

One building is a Winston Steel Works prefabricated steel structure and the rest are old buildings from the Emma Nevada plant site. All are insulated with Fiberglas and have steam heating. A well equipped machine shop is maintained at the company's Emma Nevada Mine site where heavy repairs of all kinds can be carried on.

Average service, inspection, working hours, repair hours and other data covering the principal production units, such as drills, shovels and



2. Inspection and repair



3 Lubrication and greasing

SHOP ELECTRICIAN reconditions an electric motor-generator set for equipment used in the pit.

BROKEN AND WORN truck, shovel and drill parts are repaired in the welding shop. Note Tricone bit at right.

trucks, are shown in the accompanying monthly maintenance report. In regard to the average life of truck parts and power units it has been found that tires are good for about 3,550 hours and the Diesel engines that power the 24-ton Euclid 63-TD trucks have up to 6,000 hours, but as this is a new installation there are no definite figures averaged to date.

Welding Restores Parts

Life of U-dozer blades has been increased by placing extra liners inside the blade body. Worn track rollers and bits and corner bits of dozer blades are restored by building up worn places by welding. It is planned to do this same restoration on track sprockets and track treads.

Shop Improvements Made On Tractors and Trucks

Changes made at the shops to improve over-all performance of tractors and trucks were as follows:

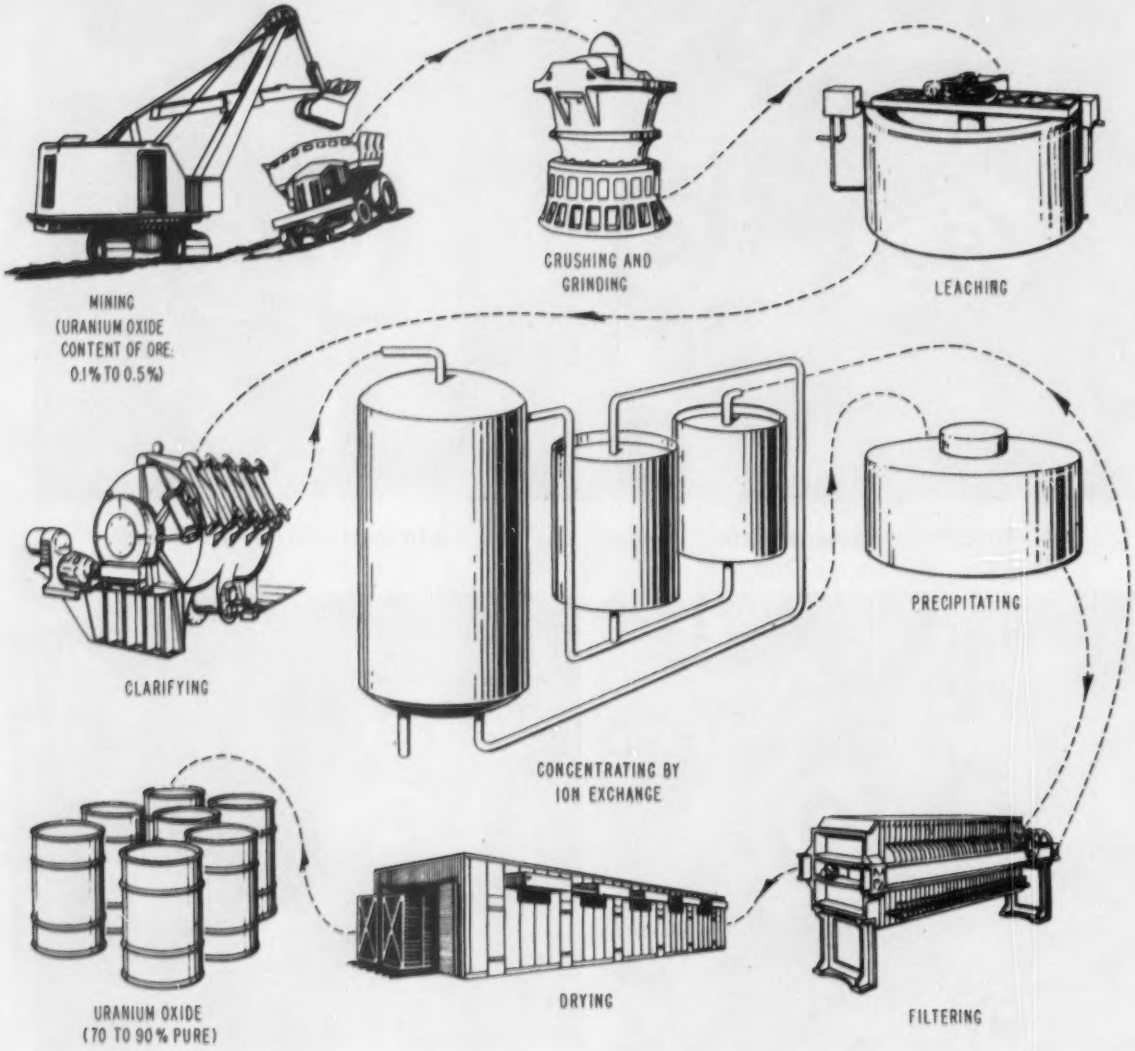
1. 110-mm injectors on 300-hp GMC truck diesel engines changed to 90-mm units.
2. Rear ends with "no-spin" differentials were purchased.
3. Dual exhaust system installed on engines to reduce manifold pressure.
4. Heavy radiator guards were installed.
5. Steel strips were installed on inside of truck-body beds to reduce wear.
6. Brake-actuated red stop lights were installed at rear of trucks.

Field repairing is handled by small crews of mechanics working out of pickup trucks and special repair trucks. With two-way radios, they can be sent quickly to the disabled unit.

Acknowledgments

A. J. O'Connor is vice president and general manager of Consolidated Coppermines Corp. and J. Frank Sharp is superintendent of operations, to whom thanks is due for permission to publish the aforegoing article. Maintenance is supervised by Thomas Gilmour, master mechanic, and his assistant Hugh Rosenlund. Data on the Tripp Pit operations were furnished by W. J. Latvala, pit superintendent.

FIG. 1 WHERE ION EXCHANGE FITS IN URANIUM PRODUCTION



The Vital Role of Ion Exchange In Uranium Production

A. B. MINDLER

J. P. TERMINI

NOT UNTIL THE U. S. AEC recently declassified the process technology for uranium recovery did it become generally known that ion exchange was the vital link in the processing chain now being used to up-grade ores containing less than 0.5% U_3O_8 to uranium concentrates containing greater than 75% uranium. The ion exchange uranium recovery process is based on preferentially adsorbing the uranyl anionic complex on strongly basic anion exchange resins and eluting the resin with an acidified salt solution to recover the uranium and simultaneously regenerate the resin.

Messrs. Mindler and Termini are process engineers with the Permutit Co., New York, N. Y.

What Is Ion Exchange?

Ion exchange may be defined simply as the reversible interchange of ions from a solid for an equivalent amount of ions contained in the contacting solution with no substantial change in the character of the solid (13). Ion exchangers are hard, insoluble and granular or spherical solids, containing active chemical groups bound to a cross-linked matrix. Commercially, the mesh size is generally minus 16 plus 50 mesh but other particle sizes are produced.

Active groups are sulphonic groups in most cation exchangers although cation exchangers with carboxylic and phenolic groups are also available. In anion exchangers, the active groups are amino groups in weakly basic

resins, quaternary ammonium groups in strong basic resins, and mixtures of these groups in ion exchange resins of intermediate basicity.

Cation exchangers are used for exchange of cations. An acid regenerated cation exchanger will exchange its hydrogen ions for other cations in solution until its store of hydrogen ions is exhausted. Thereafter, the cations held preferentially are those of the higher valence and higher atomic number which displace cations of the resin bed.

Anion exchangers are used to neutralize acids by exchange of hydroxyl ions and to exchange anions other than hydroxyl. In general, weakly basic anion exchangers, usually regenerated with soda ash, adsorb strong acids while strong base resins, normally regenerated with caustic soda, remove both weakly dissociated acids and strong acids. For applications such as uranium recovery where anion exchangers are used for exchange of anions other than hydroxyl ions, solutions of acids, salts or mixtures of salts and acids may be used for regeneration.

Table 1—Commercially Available Ion Exchangers

CATION EXCHANGERS	ANION EXCHANGERS
Sulfonated coals	**Weakly basic**
Zeo-Karb **P**	De-Acidite **P** Permutit W **P** Amberlite IR-45 **RH** Nalcite WBR **NA** Duolite A-4 **CP** Duolite A-6 **CP**
Sulfonated resins	**Intermediate basicity**
Phenol Formaldehyde	Permutit A **P** Ionac A-300 **P** Duolite A-70 **CP**
Duolite C-3 **CP**	
Cross-linked polystyrene copolymer	**Strongly basic (Quaternary amine)**
Permutit Q **P** Amberlite IR-120 **RH** Nalcite HCR (Dowex 50) **NA** Duolite C-20 **CP**	Type I (Alkyl Amine) Permutit S-1 **P** Amberlite IRA-400 **RH** Nalcite SBR **NA** Duolite A-42 **CP**
	Type II (Aklanol amine) Permutit S-2 **P** Amberlite IRA-410 **RH** Nalcite SAR **NA** Duolite A-40 **CP**
Carboxylic acid resins	
Permutit H-70 **P** Amberlite IRC-50 **RH** Duolite CS-101 **CP**	

P Permutit Co. **NA** National Aluminate Corp. (Dow)
RH Rohm & Haas Co. **CP** Chemical Process Co.

How Ion Exchange Fits in Uranium Production

Fig 1 shows how the ion exchange process fits into the over-all scheme for producing uranium concentrates.

Uranium ores, consisting largely of either tetravalent uranium (black ores) or hexavalent uranium (yellow and green ores), generally contain 0.1 to 0.5% uranium and are digested in the presence of an oxidizing agent with either acid or alkaline reagents to solubilize the uranium as an anionic complex.

Acid: $2\ UO_2^{+2} + 5\ SO_4^{-2} \rightarrow UO_2(SO_4)_3^{-4}$ (principally) $+ UO_2(SO_4)_2^{-2}$

Alkaline: $UO_2^{+2} + 3CO_3^{-2} \rightarrow UO_2(CO_3)_3^{-4}$

The choice between an acid or an alkaline process depends primarily on the type of ore (14, 15, 16, 17) and the economics of the different leaching methods for the installation being considered. Acid digestion using sulphuric acid is now being used most widely and will be reviewed briefly.

Leaching: Conventional digestion equipment with either air or mechanical agitation is used. The ground ore (30 mesh or finer) may be digested by leaching with cold or warm dilute acid. Even though the uranyl hydroxide does not start to precipitate until the pH is about 4.0, to get consistently good dissolution of uranium, sufficient acid is used to give the pulp liquor a final pH of approximately 1.5. Such highly acid solutions are required because uranium would be lost in the ferric phosphate or ferric hydroxide and basic ferric sulphate precipitates which occur at pH's of 2.5 to 3.5.

Digestion may take as long as 16 to 24 hours for optimum uranium leaching even though most of the uranium goes into solution within the first hour. The oxidizing agent, preferably manganese dioxide or sodium chlorate, aided by air and ferric ions in the leach, must be used to convert any tetravalent uranium to the more soluble hexavalent form. The quantity of manganese dioxide may be roughly 10 lb per ton of ore for most ores and higher for refractory ores (17).

A single step leach is used in preference to counter-current leaching because of lower costs. The pulp is clarified by filtration or counter-current decantation. Filtration and clarification are improved by adding a small amount of animal glue or one of the new chemical flocculating agents. Two or more stages of filtering with repulping between each step may be necessary because of the difficulty in washing the cake adequately to minimize uranium loss.

Clarified leach liquor varies in composition but in general the uranium content is 0.5-1.5 grams liter, 20-30 grams SO_4 per liter and 1 to 5 grams iron per liter and other metal sulphates.

Ion Exchange: Direct chemical precipitation of the resulting clarified leach liquor could be used to recover the uranium but this procedure has disadvantages. Higher chemical costs are encountered to neutralize all of the acid present in the relatively large volume of leach liquor. Poorer concentrate quality results because chemical precipitation is not sufficiently selective to free the uranium from other impurities in solution.

It is at this point in the processing chain that the ion exchange link appears. This new tool for hydrometallurgy concentrates and purifies the uranium in the leach liquor for the subsequent precipitation step. Briefly, the process consists of adsorbing virtually 100% of the anionic uranyl complex in solution onto anion exchange resin until the uranium capacity of the resin has been reached. Eluting solution is then used to remove the uranium from the resin and simultaneously regenerate the resin for reuse.

The ion exchange recovery process consists of exchanging anionic uranium complex values onto the resin and subsequently eluting the adsorbed metals. The reactions involved are:

$$UO_2(SO_4)_3^{-4} + 4\ R\ X \underset{\text{elution}}{\overset{\text{Adsorption}}{\rightleftharpoons}} R_4UO_2(SO_4)_3 + 4\ X^-$$

and to a lesser extent

$$UO_2(SO_4)_2^{-2} + 2\ R\ X \underset{\text{elution}}{\overset{\text{Adsorption}}{\rightleftharpoons}} R_2UO_2(SO_4)_2 + 2\ X^-$$

Where R is a quaternary ammonium resin, X is either NO_3- or Cl- and the uranyl anionic complex may be divalent or tetravalent.

The ion exchange process may be conducted by employing two techniques—resin-in-columns, discussed in detail later, or resin-in-pulp.

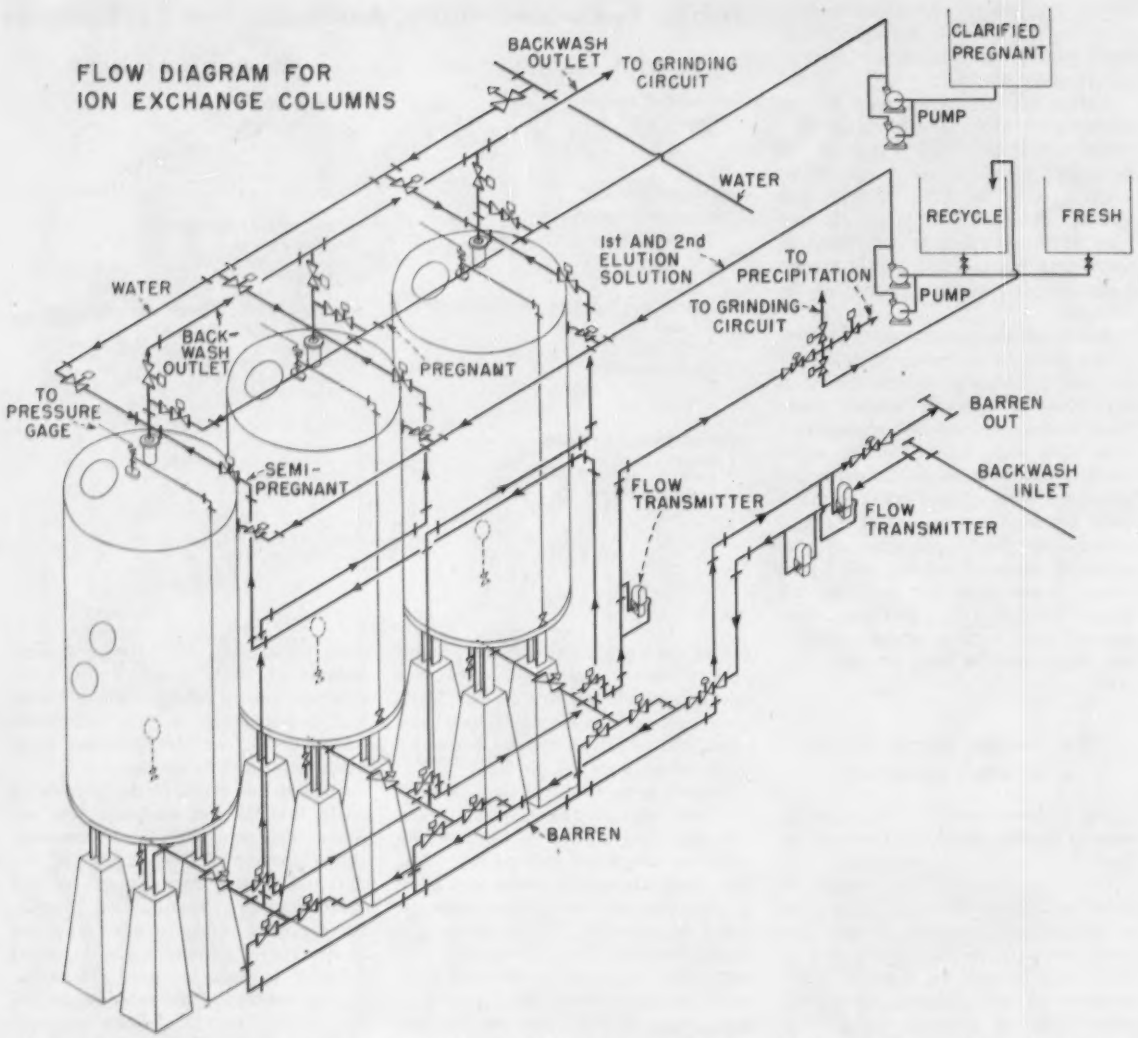


FIG. 2. Most efficient adsorption of uranium is obtained by using two or more ion exchange columns in series. For complete description of the resin-in-column operation see opposite page.

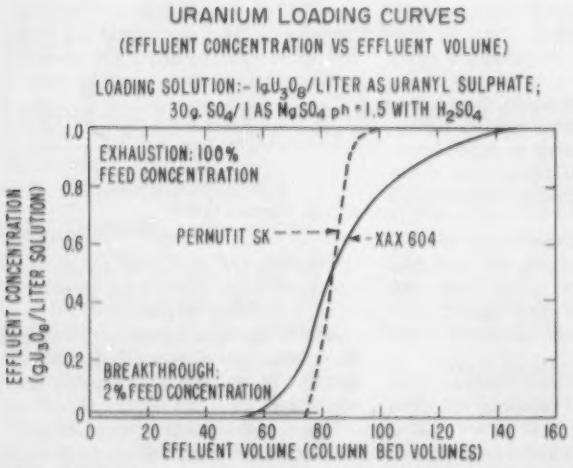


FIG. 3. Typical loading curve shows uranium breakthrough occurring before capacity of resin has been reached.

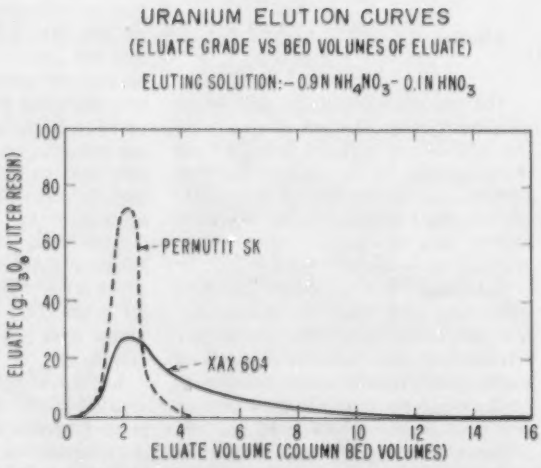


FIG. 4. Uranium concentration in elution effluent rises to peak, then tails off to 0.1 gram per liter end point.

Resin-In-Pulp Operation

Although most of the uranium is recovered by conventional ion exchange operation using columns, there are five mills in the United States based on a resin-in-pulp ion exchange process. The development of the resin-in-pulp process (18, 19) was originally pursued at the AEC Raw Materials Laboratory in Winchester, Mass., then operated by American Cyanamid Co. and now by National Lead Co. This study and ore amenability tests were continued at the AEC Raw Materials pilot plant in Grand Junction, Colo. It differs from the standard ion exchange column operation by using wire mesh baskets instead of columns, and by eliminating the clarification of the feed solution to the ion exchange resin. Thus, the process is particularly applicable for ores which cannot be easily filtered or clarified by counter-current decantation.

For the RIP process, the acid leach liquor from the digestion step is desanded with conventional equipment to remove coarse sand and then fed directly into a series of cells containing 2 to 4 baskets partially filled with anion exchange resin. The de-sanded leach pulp of approximately 1.5 pH contains 4 to 8% solids of minus 325 mesh material and has a density of approximately 1.05 to prevent floating of the resin beads. The screens forming the sides and bottom of the baskets are sized (usually 28 mesh stainless steel) to retain the predominately minus 10 plus 20 mesh beads yet to permit the pulp to pass through.

The loading and eluting circuits each consist of about 6 to 8 cells for a total of about 14 cells. Counter-current operation is used. The uranium pregnant pulp first contacts the resin, in baskets, which is already partly loaded with uranium, and passes successively from cell to cell giving up its uranium and finally contacts the freshly regenerated resin in the last cell and leaves as barren pulp. When the resin in the first cell is sufficiently loaded with uranium, the pulp flow is diverted to the second cell. The loaded resin in the first cell is drained, washed and rinsed and then becomes the last cell in the elution circuit.

Similarly, eluting solution passes through the eluting circuit by initially contacting resin containing the least amount of uranium in the first cell and finally the loaded resin in the last cell.

The RIP process satisfies a definite need where the ore presents a clarification problem. Potential savings for this case could be large although recent improvements in flocculating agents and filter aids have decreased these savings in some instances. Other methods of contacting resin with de-sanded pulp are under study.

Precipitation: The purified uranium solution is precipitated quantitatively by neutralizing with ammonia or magnesium oxide to yield a corresponding diuranate cake containing greater than 70% uranium. Precipitation is sometimes done in two stages by adding lime to a pH of 3.7 to precipitate most of the iron present in solution. This is returned to leaching since it carries some uranium. The uranium is then precipitated by neutralizing to a pH of 6.5 with ammonia or magnesium oxide to form the uranium precipitate. The filtrate from the precipitation step is recycled and reused for the ion exchange elution by adding acid and, if necessary, the appropriate eluting chemical. Over-all recovery of greater than 90% is obtained by the steps just described.

Resin-In-Column Operation

In addition to the five RIP plants now operating, there are more than twenty ion exchange column plants in operation in Africa, Canada, Australia and the U. S. More installations are in construction or design phases. These columns are similar to the conventional zeolite water softening units with the necessary modifications in engineering to obtain optimum chemical performance, corrosion resistance and facility of operation.

As shown in the typical loading curve (Fig 3), uranium breakthrough occurs before the uranium capacity of the resin has been reached. Therefore, uranium adsorption is most efficient using 2 or more columns in series so that the lead column is exhausted at breakthrough of the second column.

The clarified acid leach liquor is passed downflow through the first bed of the anion exchange resin where a portion of the metal value is removed. The partly barren solution then passes downflow through the second bed where the remainder of the uranium is removed to produce substantially a barren solution. After the appearance of uranium in the effluent from the second column which usually occurs after the resin in the first column has been substantially saturated with uranium, the pregnant liquor of the first column is rinsed through to the second column.

The first column containing exhausted resin is then removed from the adsorption stream and the third column containing freshly eluted resin is placed onstream in series with the second column. The loading cycle is then continued with the leach liquor passing first through the second column and the partly barren liquor from this column passing through the third column to produce barren solution.

In series column operation for uranium adsorption, a resin with a steep breakthrough curve gives the most efficient use of the uranium capacity of the resin. The volume of pregnant feed to uranium breakthrough should be large compared with the volume of exhaustion after breakthrough. Should uranium breakthrough occur early during the loading step, and if this breakthrough volume is less than 50% of the exhaustion volume, operation at less than the exhaustion volume in the first column would be needed to prevent uranium loss due to early breakthrough of uranium in the effluent from the second column. This would decrease the operating capacity of the resin and increase plant size and costs. The loading curve shown in Fig 3 is a desirable one since it would make it possible to fully saturate the resin in the first column before uranium breakthrough occurs in the effluent from the second column.

The retention time of the pregnant leach solution in each resin bed is equal to the ratio of the flow rate to the resin void volume (40% resin bed volume) and is generally about 3 minutes. A decreased flow rate (increased retention time), an increased bed depth, and a fast loading resin will increase the steepness of the loading curve.

Resin Capacity and Poisoning

Depending on the type of resin, the composition and method of operation, the actual operating capacity of the strongly basic anion exchange resins range from 2 to 5 lb U_3O_8 per cu ft. Among the factors affecting uranium loading are pH and the concentration of sulphate and ferric ions and certain poisoning constituents.

Decrease in pH of the pregnant feed solution from 1.5 to 0.5 will decrease the free sulphate concentration and increase the bisulphate ion which, unlike the sulphate ion, does not form the adsorbable anionic complex of uranium. A sulphate concentration of approximately 20 to 30 grams SO_4 per liter is preferred. Very high sulphate concentrations are objectionable, however, because the proportion of the resin capacity occupied by the sulphate cations instead of the uranyl complex is increased and consequently the uranium capacity of the resin is decreased.

Certain ions held very tightly by the resin are not completely removed during elution. With time, these "poisons" accumulate gradually on the resin in

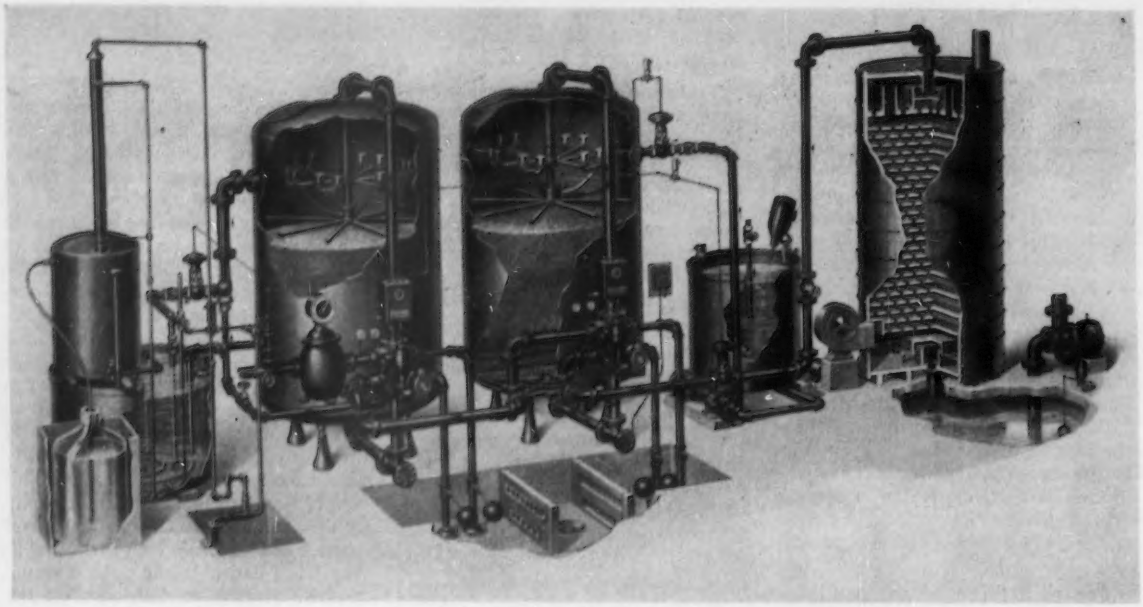


FIG. 5. Uranium is first removed from clarified acid leach solution as it passes down through the first column. Partly barren solution then passes down through second bed where remaining uranium is removed leaving solution barren.

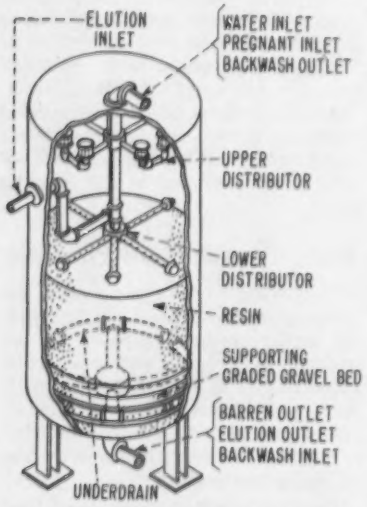


FIG. 6. Here's what the inside of an ion exchange column looks like.

sufficient quantity to markedly reduce its uranium capacity and its reaction rate. Cobalticyanide and polythionate in South African operations and molybdenum in some ores on the Colorado Plateau are examples of such poisons. Silica also affects the behavior of certain resins in causing a lower rate of reaction.

Periodic chemical treatment of the resin is necessary to restore its capacity and increase its exchange rate. Molybdenum may be removed with a moderately strong caustic solution; polythionate with a highly alkaline sodium sulphide solution; deposited silica in the resin pores with caustic solution. However, cobalticyanide removal from the resin requires extensive treatment with thiocyanate solutions. Extensive washing is used on the gold ore slimes to remove cobalticyanide before the acid leach and ion exchange steps.

Chloride and nitrate anions in concentrations up to approximately 1 normal strength have a strong affinity for complexing the uranyl ions as cationic and neutral complex. This will lower the resin capacity for uranium by reducing the concentration of anionic uranyl complex and result in poor uranium recovery because the cationic and neutral complexes of uranium pass through the resin bed without being adsorbed. On the other hand it is the complexing action of chlorides and nitrates that makes them effective for elution.

Selectivity of Resin During Loading

Ferric iron is adsorbed by the resin to a slight extent and thus occupies several percent of the capacity of the loaded resin but this is not serious. Significant, however, is the fact that the final precipitated product might contain as much as 10 to 20% iron and thus requires that the double precipitation technique be used wherever necessary. Vanadium (IV), aluminum, manganese, ferrous iron, alkali and alkaline earth materials are not picked up from sulphate solutions by anion exchange resins. Vanadium (V) is adsorbed but its content may be reduced by converting it to the (IV) state with sulphur dioxide or by adjustment of the EMF of the solution. The less commonly prevalent metals such as cobalt, copper, nickel and rare earths are also rejected by the anion exchange resin.

Elution

Elution with an acidified salt solution recovers the uranium from the resins and simultaneously prepares it for the next loading cycle.

The column containing the uranium-saturated resin is treated for elution of the uranium by first backwashing upflow with water to loosen and regrade the bed and to remove dirt and suspended matter filtered out of the pregnant liquor during the loading cycle. Elution is then conducted by introducing recycle eluate and then fresh eluate through the lower distributor of the ion exchange column. After the fresh eluate, water is distributed through the high level distributor. The first portion of the effluent goes to the leach circuit, the second to precipitation, and the third to recycle.

The optimum chloride or nitrate salt concentration is approximately 1 Normal. At high levels, strongly adsorbed anionic uranyl complexes of these anions are formed. Nitrate elution in South African operations is carried out using a 0.6 to 0.9N NH_4NO_3-0.1 to 0.4N NHO_3 while chloride elution with approximately 1N NaCl-0.15 N H_2SO_4 is used in Canadian operation. The choice of chloride or nitrate elu-

tion is primarily economic and is based on the comparative availability and cost of different chemicals. Corrosion and efficiency of eluting specific poisons may also influence this selection.

The volume of eluting solution required for complete uranium removal from the resin is dependent on such factors as the type of resin, the type of eluting solution, the flow rate, the resin bed depth, and the type of ions on the resin. The volume of eluting solutions is usually equivalent to 20 to 25 resin bed volumes for chloride elution and 10 to 15 resin bed volumes or even less with certain type resins for nitrate elution. A small eluting volume is desirable because it reduces elution time and lowers the neutralization and reacidification costs in precipitation.

The retention time for elution, about 10 minutes, is longer than the time for adsorption. The first bed volume displaced from the column during elution contains practically no uranium but consists essentially of sulphate and ferric ions which are less tightly held by the resin. Then, the uranium concentration in the elution effluent rises rapidly to a maximum and drops off to the tailing shown in Fig 4 until the 0.1 gram U_3O_8 per liter end-point for elution has been reached. Thus, the first effluent of approximately 1 resin bed volume, containing little if any uranium, is returned to the leaching or grinding step. The remaining bed volumes of eluting solution are then equally divided with the first part containing the highest uranium concentration going to precipitation and the second part being recycled for the initial part of the next elution.

Equipment

The ion exchange uranium recovery plant consists of one or more sets of at least three columns. In low tonnage plants four ion exchange columns comprise a set, operating as a unit. A four-column plant is desirable in that the additional column is available should resin restoration or maintenance be needed because this may be done without seriously decreasing production by operating the remaining three columns. In high tonnage plants multiple sets of columns are employed and the largest installation has 15 sets of 3 columns or 45 columns.

A typical ion exchange column with its internal distribution and collection system is shown in Fig 5. The columns are rubber-lined steel and range from 7 to 9 ft in diameter and 12 or more feet straight shell height with about 5 ft or more deep resin beds.

Functions of the upper distributor in the top part of the column are to distribute pregnant liquor and water during downflow operation and to collect backwash water. The lower distributor located directly above the resin bed distributes eluting solution.

The strainer system, consisting of perforated curved laterals at the bottom of the column, distributes backwash water and collects downflow solution. Above the strainer system is a bed of carefully graded gravel and coarse sand which supports the ion exchange resin bed.

Rubber-lined piping with individual automatically operated on-off valves are used to select and control the direction of liquid flow to and from the manifold and individual column piping. Flow rate control valves are used in the backwash influent and barren and elution effluent lines.

Most ion exchange plants are designed for completely automatic operation based on a volume and/or time control. For adsorption, a totalizer-recorder-controller arrangement re-

(*Continued on p 114*)

Table 2. These Uranium Plants Use Ion Exchange

Company	Location	Approximate starting date
UNITED STATES		
Kerr McGee Oil Industries	Shiprock, N. M.	1955
Union Carbide & Carbon Co., Nuclear Div.	Uravan, Colo.	1955
Continental Uranium Co.	La Sal, Utah	Projected
U. S. AEC	Monticello, Utah	1955
Anaconda Co.	Grants, N. M.	1955
Rare Metals Corp.	Tuba City, N. M.	1956
Uranium Reduction Co.	Moab, Utah	1956
Mines Development Co.	Edgemont, S. D.	1956
CANADA		
Gunnar Mines, Ltd.	Uranium City, Sask.	1955
Pronto Uranium Mines	Blind River, Ont.	1955
Algom Uranium Mines, Ltd.	Quirk Lake, Blind River	1956
Algom Uranium Mines, Ltd.	Nordic Lake, Blind River	1956 or 7
Consolidated Dennison	Blind River	1957
Bicroft Uranium Mines	Bancroft, Ontario	1956
Faraday Uranium Mines	Bancroft, Ontario	1956
Dyno Uranium Mines	Bancroft, Ontario	1957
Lorado Uranium Mines	Uranium City, Sask.	1957
Rayrock Uranium Mines	Hay River, NWT	Projected
UNION OF SOUTH AFRICA		
West Rand Consolidated Mines, Ltd	West Rand Cons.	October 1952
Daggafontein Mines, Ltd.	Daggafontein	April 1953
Blyvooruitzicht G. M. Co., Ltd.	Blyvooruitzicht	April 1953
Western Reefs Expl. & Dev. Co., Ltd.	Western Reefs	September 1953
Stilfontein	Stilfontein	September 1953
Ellaton		
Afrikander Lease		
New Klerksdorp		
Babrosco		
Randfontein Estates G. M. Co. W., Ltd.	Randfontein	February 1954
East Chamo d'Or G. M. Co., Ltd.		
Luipaards Vlei Estate & G. M. Co., Ltd.	Luipaards Vlei	November 1954
Vogelstruisbult G. M. Areas, Ltd.	Vogelstruisbult	December 1954
President Steyn G. M. Co., Ltd.	President Steyn	January 1955
President Brand G. M. Co., Ltd.		
Free State Geduld Mines, Ltd.		
Western Holdings, Ltd.		
Welkom G. M. Co., Ltd.		
Freddies Consolidated	Welkom	January 1955
Harmony G. M. Co., Ltd.	Harmony	March 1955
Dominion Reefs (Klerksdorp), Ltd.	Dominion Reefs	June 1955
Virginia O. F. S. G. M. Co., Ltd.	Virginia	September 1955
Merriespruit (O.F.S.) G. M. Co., Ltd.		
West Driefontein G. M. Co., Ltd.	West Driefontein	March 1956
Doornfontein G. M. Co., Ltd.		
Vaal Reefs Expl. & Mining Co., Ltd.	Vaal Reefs	March 1956
AUSTRALIA		
Rum Jungle	Northern Territory	1955
Port Pirie	South Australia	1955
BELGIAN CONGO		
Union Miniere du Haut-Katanga	Belgian Congo	1953

How to get the most out of your visit to . . .

AMC's Los Angeles Convention

The Week's Program

MONDAY, OCTOBER 1

10:00 A.M. OPENING SESSION

Presiding: Garner A. Beckett, pres., Riverside Cement Co., Los Angeles; chairman, Western Division, American Mining Congress

Welcome to Los Angeles

Arnold O. Beckman, pres., Beckman Instruments Inc.; president, Los Angeles Chamber of Commerce

Howard I. Young, pres., American Zinc, Lead & Smelting Co., St. Louis; president, American Mining Congress

Walter C. Lawson, gen. mgr., Phelps Dodge Corp., Douglas, Ariz.; national chairman, Program Committee

Guy V. Woody, gen. representative, sales, Allis-Chalmers Manufacturing Co., Milwaukee; chairman, Manufacturers Division, AMC

L. C. Campbell, vice pres., Eastern Gas & Fuel Associates, Pittsburgh; chairman, Coal Division, AMC

Introduction of distinguished guests

Presiding: Howard I. Young, president, American Mining Congress

A Look at Our National Mineral Policies

An official of the Department of the Interior

Hon. Clair Engle, U. S. Representative from California; chairman, House Interior & Insular Affairs Committee

2:00 P.M. LABOR RELATIONS

Chairman: Clyde E. Weed, pres., Anaconda Co., New York

Labor Relations and States' Rights

Hon. Barry Goldwater, U. S. Senator from Arizona

The Taft-Hartley Act—A Realistic Appraisal Today

Hon. Fred A. Hartley, Jr., National Right-to-Work Committee, Washington, D. C.

Union Monopoly

Leo Wolman, National Bureau of Economic Research Inc., New York

2:00 P.M. MILLING AND METALLURGY

Chairman: Roy A. Hardy, consulting engineer, Getchell Mine, Inc., Reno, Nev.

Basic Economics—Wet vs. Dry Grinding

Fred C. Bonc, consulting engineer, Allis-Chalmers Manufacturing Co., Milwaukee, Wis.

Experience with Cyclones at Chino

Paul A. Lemke, supervisor of metallurgy, Kennecott Copper Corp., Hurley, N. M.

High Voltage and Magnetic Separation

J. Hall Carpenter, partner, Carpco Research & Engineering Co., Jacksonville, Fla.

Emulsion Flotation

A. W. Fahrenwald, Dean Emeritus, School of Mines, University of Idaho, Moscow, Idaho

EVENING OPEN—NO SCHEDULED ENTERTAINMENT

TUESDAY, OCTOBER 2

10:00 A.M. DEVELOPMENTS IN INDUSTRIAL MINERALS

Co-Chairmen:

D. L. Marlett, vice pres., Great Lakes Carbon Corp., Los Angeles

Wm. Wallace Mein, Jr., pres., Calaveras Cement Co., San Francisco

Significant Developments in Ceramic Raw Materials and Markets

Richard F. Brooks, mgr. of mining operations, Gladding, McBean & Co., Los Angeles

Diatomaceous Earth in Calcium and Magnesium Silicates

Herbert L. King, Jr., research mgr., Celite Dept., Johns-Manville Corp.

What Makes a Gypsum Deposit Economic?

J. F. Havard, vice pres., Fibreboard Paper Products Corp., San Francisco

Recent Developments in Limestones, Dolomites and Cement in California

Oliver E. Bowen, Jr., California Division of Mines, San Francisco

Perlite and Other Lightweight Aggregates

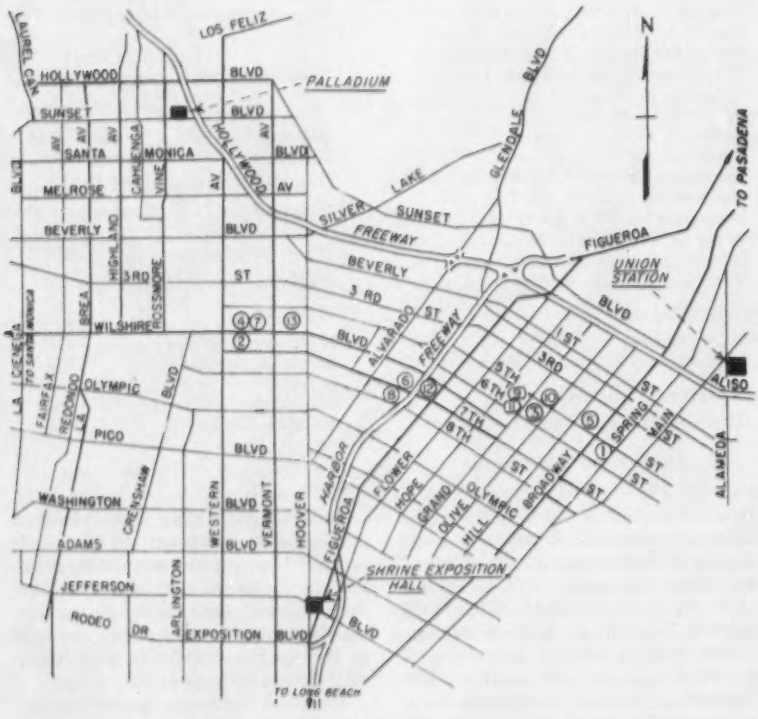
Paul W. Leppla, technical director, Dicalite Div., Great Lakes Carbon Corp., Los Angeles

10:00 A.M. EXPLORATION AND GEOLOGY

Co-Chairmen:

James Boyd, vice pres. exploration, Kennecott Copper Corp., New York

Ira B. Joralemon, consulting engineer, San Francisco



USE THIS GUIDE to convention sites and hotels. Hotel locations are as follows: **1.** Alexandria; **2.** Ambassador; **3.** Biltmore; **4.** Chapman Park; **5.** New Clark; **6.** Commodore; **7.** Gaylord; **8.** Mayfair; **9.** Mayflower; **10.** San Carlos; **11.** Savoy; **12.** Statler; **13.** Sheraton-Town House. Most of the sessions will be at Shrine Hall.

Successful Results of Exploration in Recent Years

Ira B. Joralemon

Symposium on Ore Discoveries and Methods of Exploration

John K. Gustafson, geologist, M. A. Hanna Co., Cleveland

Speaker from Falconbridge Nickel Mines, Ltd., Falconbridge, Ont., Canada

Thomas G. Nolan, director, U. S. Geological Survey

Paul T. Allsman, chief mining engineer, U. S. Bureau of Mines

Other speakers to be announced

10:00 A.M. URANIUM MILLING

Chairman: Marvin L. Kay, vice pres. & gen. mgr., Climax Uranium Co., Grand Junction, Colo.

Metallurgy of Uranium Ores

James L. Lake, mgr. of exploration & process development, Union Carbide Nuclear Co., Grand Junction, Colo.

Milling Operations at Anaconda's Bluewater Plant

E. C. Peterson, asst. mgr., and D. C. Mathews, chief metallurgist, Anaconda Co., Grants, N. M.

Research and New Developments in Uranium Processing

C. K. McArthur, mgr. of National Lead Co.—AEC Pilot Plant, Grand Junction, Colo.

E. H. Crabtree, mgr., Colorado Research Foundation, Inc., Colorado School of Mines, Golden, Colo.

Plant Application of Solvent Extraction in Uranium Milling

Woodrow Knott, plant mgr., Climax Uranium Co., Grand Junction, Colo.

2:00 P.M. TAX PANEL

Chairman: Hon. Thos. E. Martin, U. S. Senator from Iowa

Panel Members to be announced

Gold, Silver and Monetary Policy

Co-Chairmen:

Donald H. McLaughlin, pres., Homestake Mining Co., San Francisco; chairman, Gold Producers Committee, AMC

Robert M. Hardy, Jr., pres., Sunshine Mining Co., Spokane

Our Gold Policy

B. F. Pitman, Jr., pres., Pitman & Co., Investment Bankers, San Antonio, Tex.

The Silver Situation

Hon. Wallace F. Bennett, U. S. Senator from Utah

Future Prospects for Silver

Elgin Groseclose, economic counsel, Washington, D. C.

2:00 P.M. DRILLING SYMPOSIUM

Chairman: O. A. Rockwell, vice pres., Eagle-Picher Co., Miami, Okla.

Standardization of Measurements

Raymond Stewart, asst. planning engineer, Climax Molybdenum Co., Climax, Colo.

Discussion:

L. F. Bishop, research engineer, Anaconda Co., Butte, Mont.

S. S. Clarke, consulting engineer, Baxter Springs, Kans.

Maintenance of Rock Drills, Bits and Drill Steel

C. N. Kravig, mine supt., Homestake Mining Co., Lead, S. D.

Discussion:

T. E. Giggey, sales repr., Ingersoll-Rand Co., New York

George Hazen, plant supt., Brunner & Lay Co., Los Angeles

N. L. McCombs, applications engineer, Rock Drill Div., Joy Manufacturing Co., Claremont, N. H.

2:00 P.M. OPEN PIT MINING

Chairman: A. D. Chisholm, managing partner, Pickands Mather & Co., Duluth, Minn.

Rotary Drilling for Open Pit Blast Holes

R. W. Whitney, mgr. of mines, M. A. Hanna Co., Cleveland

Drilling at Eagle Mountain

Kenneth B. Powell, supt., Raw Materials Kaiser Steel Corp., Fontana, Calif.

Transportation From Open Pits Belts and Belt Conveyors

Lloyd S. Campbell, asst. gen. supt., Eastern Dist., Oliver Iron Mining Div., U. S. Steel Corp., Virginia, Minn.

Application of Various Types of Trucks for Open Pit Haulage

C. V. Isbell, pres., Isbell Construction Co., Reno, Nev.

Rail Haulage at Morenci

Warren E. Fenzi, gen. supt., and Lawrence Ormsby, mine supt., Phelps Dodge Corp., Morenci, Ariz.

Skip Haulage

Richard P. Cardew, engr., National Iron Co., Duluth

6:30 P.M. MINERS JAMBOREE

Hollywood Palladium

WEDNESDAY, OCTOBER 3

10:00 A.M. PUBLIC LAND PROBLEMS

Chairman: Hon. William A. Dawson, U. S. Representative from Utah

Administration of Public Laws 167 and 585—the "Multiple Use" Acts

Hon. Wesley A. D'Ewart, Washington, D. C. Edward P. Cliff, assistant chief, U. S. Forest Service

Curbing Military Land Withdrawals

Hon. Cliff Young, U. S. Representative from Nevada

Legal Needs to Permit Broader Use of New Exploration Techniques

Moderator: Elmer F. Bennett, Assistant to the Secretary of the Interior

Panel Members:

C. Jay Parkinson, Anaconda Co., New York

Clair M. Senior, Senior & Senior, Salt Lake City

Robert S. Palmer, exec. vice pres., Colorado Mining Association, Denver

Roger H. McConnel, chief geologist, Bunker Hill Co., Kellogg, Idaho

Richard N. Hunt, vice pres., U. S. Smelting, Refining & Mining Co., Salt Lake City

10:00 A.M. UNDERGROUND MINING

Chairman: John D. Bradley, pres., Bunker Hill Co., Kellogg, Idaho

Support of Heavy Ground in Bulk Mining Operations

R. W. Edwards, supt., Inland Steel Co., Ishpeming, Mich.

Discussion:

J. W. Still, consulting engineer, Prescott, Ariz.

Underground Uranium Mining Methods

Donald T. Delicate, supt. of mines, Utah Div., Homestake Mining Co., Moab, Utah

Underground Transportation Symposium Rail Haulage

Charles A. Cleeves, asst. mine supt., Climax Molybdenum Co., Climax, Colo.

Conveyors

J. E. Tong, asst. mgr. & mine supt., Duval Sulphur & Potash Co., Carlsbad, N. M.

Auto Trucks Underground

Gill Montgomery, vice pres. & gen. mgr., Fluorspar Div., Minerva Oil Co., Eldorado, Ill.

10:00 A.M. MILLING AND METALLURGY

Chairman: F. A. McGonigle, vice pres., Haile Mines, Inc., New York

New Conveying and Electronic Weighing System

Melvin A. Stokke, supt. of crushing and conveyor plant, Anaconda Reduction Works, Anaconda, Mont.

Taconite Beneficiation

Robert J. Linney, vice pres., operations, Reserve Mining Co., Silver Bay, Minn.

Present State of the Art of Oxidation, Reduction and Leaching

Frank A. Forward, head, Dept. of Mining & Metallurgy, University of British Columbia, Vancouver, B. C., Canada

Applications of Solvent Extraction in the Metallurgical Industry

R. S. Olson, metallurgist, Mining Technical Service, Dow Chemical Co., Pittsburg, Calif.

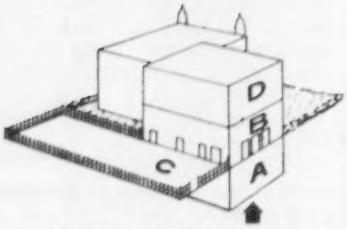
2:00 P.M. MANAGEMENT PROBLEMS

Chairman: Clark L. Wilson, vice pres., New Park Mining Co., Salt Lake City

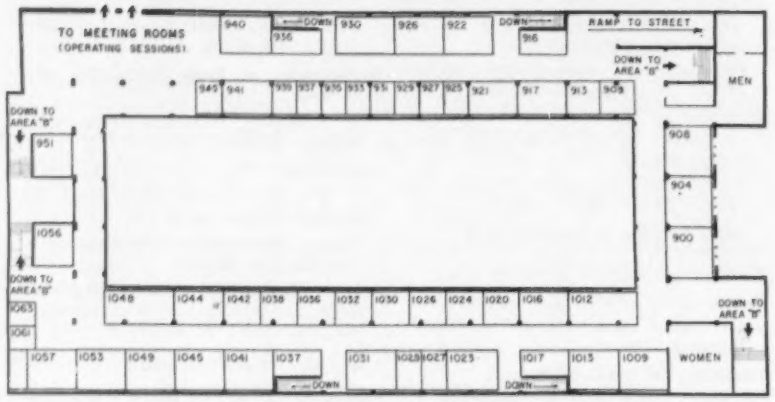
Mining's Shortage of Engineering and Scientific Manpower—What to do about it?

(Continued on p 109)

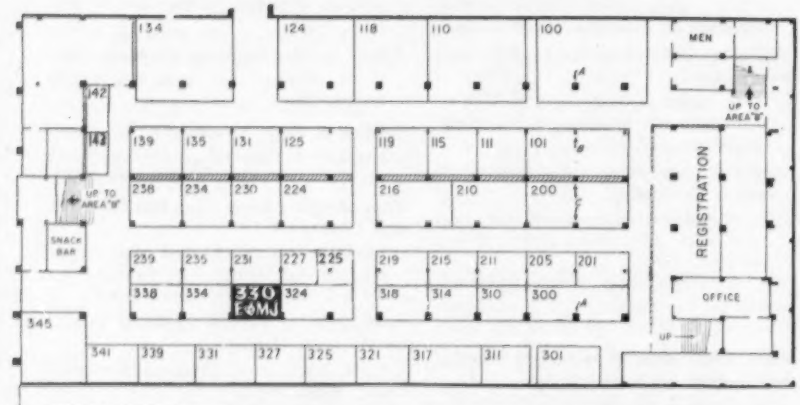
Use This Amphitheater Floor Plan and



LOCATION OF EXHIBIT AREAS

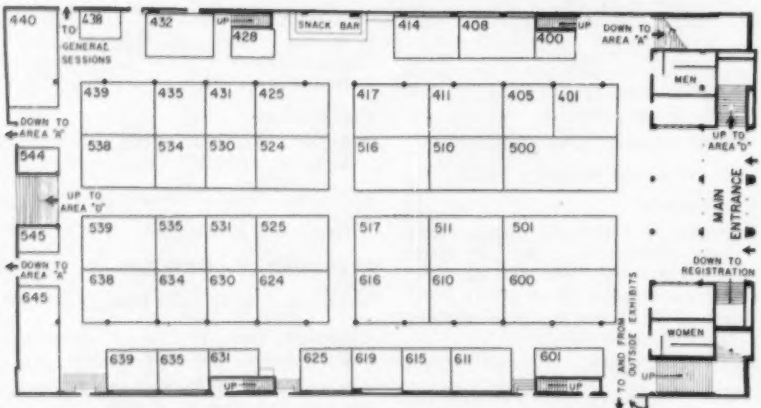


AREA "D" ➔



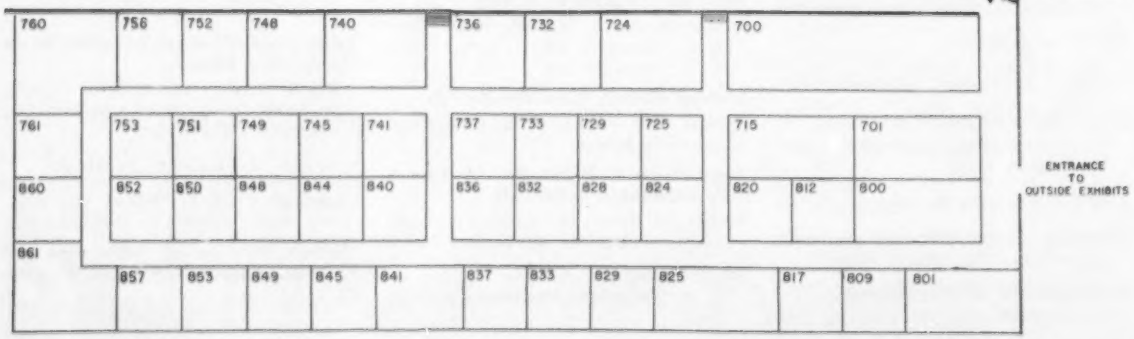
AREA "A" ➔

Be sure to stop at E&MJ's booth No. 330 for your entertainment guide to Los Angeles and for valuable reprint order blanks.



AREA "B" ➔

AREA "C" ➔



Guide to New Cost-Cutting Equipment

Aero-Coupling Corp. **927**
Aeroproducts Operations, Allison Div., General Motors Corp. **857**
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Albany Felt Co. **1017**
Allegheny Ludlum Steel Corp. **1020**
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Allis-Chalmers Mfg. Co. **725, 729, 733, 737, 824, 828, 832, 836**
Alloy Steel & Metals Co. **205**
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American Manganese Steel Div. **511**
American Steel Foundries **1012**
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Galigher Co. **301**
Gardner-Denver Co. **425**
General Electric Co. **525**
Goodman Mfg. Co. **524**
Goodrich Co., B. F. Industrial Products Div **324**
Gould-National Batteries, Inc. **341**
Griphoist, Inc. **1061**

Hardinge Co., Inc. **936**
Harnischfeger Corp. **600**
Hawthorne, Inc., Herb J. **1044**
Hercules Motors Corp. **234**
Hercules Powder Co. **311**
Hewitt-Robins Inc. **200**
Homelite a division of Textron American, Inc. **1036**
Hough Co., Frank G. **124**
Houston Technical Laboratories **939**
Humphreys Investment Co. **327**

Ingersoll-Rand Co. **531, 535, 539**
International Harvester Co. **100, 110, 118**
International Nickel Co., Inc. **338**

Jaeger Machine Co. **752**
Jeffrey Mfg. Co. **500, 510**
Joy Mfg. Co. **517, 616, 625, 619, 615, 724**

Kennametal Inc. **238**
Kenworth Motor Truck Co. **760**
Koehring Co. **833**

Le Roi Div. Westinghouse Air Brake Co. **908**
Leschen Wire Rope Div **941**
LeTourneau-Westinghouse Co. **732, 736, 740**
Link-Belt Co. **331**
Longyear Co., E. J. **432**
Los Angeles Scientific Instrument Co. **913**
Ludlow-Saylor Wire Cloth Co. **935**
Lukens Steel Co. **1049**

Mack Trucks, Inc. **134**
Mancha Storage Battery Locomotive Div. Goodman Mfg. Co. **524**
Marion Power Shovel Co. **761, 860**
Mine Safety Appliances Co. **624**
Mining Congress Journal **945**
Mining Engineering **1013**
Mining World **937**
Mobile Drilling, Inc. **749, 848**
Moran Engineering Co. **345**
Multi-Metal Wire Cloth Co., Inc. **909**

National Filter Media Corp. Western Div. **1042**
National Malleable & Steel Castings Co. **417**
National Supply Co. **231**
Nordberg Mfg. Co. **219**

Ohio Brass Co. **917**
Olin Mathieson Chemical Corp. Explosives Div. **210**
Ore & Chemical Corp. **401**

Pioneer Engineering Works, Inc. **841**
Pit & Quarry **227**
Productive Equipment Corp. **544**

Quaker Pioneer Rubber Mills Division of H. K. Porter Co., Inc. of Pittsburgh **1031**

Raybestos-Manhattan, Inc. Manhattan Rubber Div. **310**
Reich Bros. Mfg. Co., Inc. **801**
Rock Products **925**
Roebling's Sons Corp., John A. **611**
Rome Cable Corp. **926**

St. Regis Paper Co., **225**
Sanford-Day Iron Works, Inc. **701**
Sharples Co. **837**
Sheffield Steel Div. Armco Steel Corp. **931**
Sika Chemical Corp. **1057**
Simplex Wire & Cable Co. **1048**
Southwestern Engineering Co. **610**
Spencer Chemical Co. **438**
Standard Steel Corp. **143**
Stearns Magnetic, Inc. **131**
Stephens-Adamson Mfg. Co. **904**
Stoody Co. **645**
Stratoflex, Inc. **405**

Thomas Flexible Coupling Co. **545**
Thor Power Tool Co. **300**
Timken Roller Bearings Co. **635**
Tool Stear Gear & Pinion Co. **400**
Traylor Engineering & Mfg. Co. **922**
Twin Disc Clutch Co. **809**
Tyler Co., W. S. **211**

Union Wire Rope Corp. **215**
United States Rubber Co. **125**
United States Steel Corp. **408, 414**
Universal Engineering Corp. **753, 852**

Varel Mfg. Co. **1024**
Vascoloy-Ramet Corp. **334**
Victaulic Company of America **631**
Vulcan Iron Works Co. **748**

Wedge Wire Corp. **921**
Western Gear Corp. **135**
Western Machinery Co. **101**
Western Precipitation Corp. **216**
Western Rock Bit Mfg. Co. **314**
Westinghouse Electric Corp. **501**
Wheelabrator Corp. **1056**
White Motor Co. **840, 844**
Whitney Chain Co. **1063**
Wild Heerbrugg Instruments, Inc. **933**
Willys Motors Inc. **119**
Winter-Weiss Co. **321**
Worthington Corp. **853**

The Week's Program

(Continued)

Morrough P. O'Brien, chairman, Dept. of Engineering, University of California, Berkeley, Calif.

Non-Productive Wage Costs and Their Significance

L. J. Randall, pres., Hecla Mining Co., Wallace, Idaho

Education of Employees in the Economic Principles of Mining

Howard B. Gundersen, asst. dir. of industrial relations, Kennecott Copper Corp., Salt Lake City

Incentive Plans in the Mining Industry—A Panel Discussion

John Edgar, mgr., Mining Div., Sunshine Mining Co., Kellogg, Idaho

Theodore Barry, pres., Theodore Barry & Associates, Los Angeles

Morley H. Mathewson, mgr., Industrial Engrg. Dept., International Minerals & Chemical Corp., Chicago

2:00 P.M. INDUSTRIAL MINERALS—PRODUCTION AND PROCESSING

Co-Chairmen:

Wm. Wallace Mein, Jr., pres., Calaveras Cement Co., San Francisco

D. L. Marlett, vice pres., Great Lakes Carbon Corp., Los Angeles

Heat Processing of Pelletized Materials as Developed for the Cement Industry

B. H. Puerner, asst. mgr., Processing Machinery Dept., Allis-Chalmers Manufacturing Co., Milwaukee

The Week's Program

(Continued)

Production of Specification Gravels for Concrete by Heavy Media Separation

F. E. Legg, Jr., asst. prof., Engineering Materials, University of Michigan, Ann Arbor, Mich.

Recent Developments in Mining and Transportation of Gilsonite

John H. Baker, asst. to mgr. of production, American Gilsonite Co., Salt Lake City

Union Oil's Shale Demonstration Plant—Mining and Retorting Methods

Fred L. Hartley and G. H. Hemmen, Research Dept., Union Oil Co. of Calif., Brea, Calif.

R. H. Wightman, mine mgr., Riverside Cement Co., Riverside, Calif.

New Underground Mining Development at Crestmore

2:00 P.M. URANIUM EXPLORATION AND MINING

Chairman: T. O. Evans, chief mining engr., Atchison, Topeka & Santa Fe Railway Co., Prewitt, N. M.

Uranium Developments in the West

A. E. Jones, mgr., Grand Junction Operations Office, U. S. Atomic Energy Commission, Grand Junction, Colo.

Ambrosia Lake Uranium Development

Speaker to be announced

Open Pit Operations at the Jackpile Mine

Albert Fitch, mgr., and John Herndon, mine supt., Anaconda Co., Grants, N. M.

The Gunnar Uranium Deposit, Lake Athabaska

J. N. Botsford, mine mgr., Gunnar Mines Ltd., Uranium City, Sask., Canada

What the Years After 1962 Hold for the Independent Uranium Prospector and Miner

G. R. "Buffalo" Kennedy, Rio de Oro Uranium Mines, Inc., Oklahoma City, Okla.

EVENING OPEN—NO SCHEDULED ENTERTAINMENT

THURSDAY, OCTOBER 4

10:00 A.M. STATE OF THE METAL MINING INDUSTRIES

Chairman: Walter C. Lawson, gen. mgr., Phelps Dodge Corp., Douglas, Ariz.

Nonferrous Metals

Simon D. Strauss, vice pres., American Smelting & Refining Co., New York

Iron Ore

Walter A. Sterling, pres., Cleveland-Cliffs Iron Co., Cleveland

Light Metals

Lawrence Litchfield, Jr., vice pres., Mining Div., Aluminum Corp. of America, Pittsburgh

Strategic Metals

S. H. Williston, vice pres., Cordero Mining Co., Palo Alto, Calif.; chairman, Strategic Minerals Committee, AMC

Uranium

Merritt K. Ruddock, Almar Exploration Co., San Francisco

Special Metals and Rare Earths

Eugene B. Hotchkiss, vice pres., Vitro Corp. of America, New York

World Mineral Resources

Speaker to be announced

10:00 A.M. OPEN PIT MINING

Chairman: C. D. Michaelson, gen. mgr., Western Mining Divisions, Kennecott Copper Corp., Salt Lake City

Mining Operations of the Reynolds Metals Co.

Walter L. Rice, pres., Reynolds Mining Corp., Richmond, Va.

Development Planning of Open Pit Mining in the Butte District

E. P. Shea, in charge of Butte Geological Dept., Anaconda Co., Butte, Mont.

Boron Mining in California

Willis H. Wamsley, mine supt., Pacific Coast Borax Div., U. S. Borax & Chemical Corp., Boron, Calif.

Operations at the Silver Bell Mine

D. R. Purvis, supt., Silver Bell Unit, American Smelting & Refining Co., Silver Bell, Ariz.

10:00 A.M. HEALTH AND SAFETY CONFERENCE

Chairman: R. R. Williams, Jr., mgr., Mining Dept., Colorado Fuel & Iron Corp., Pueblo, Colo.

Organizing for Safety

Leonard R. Flicker, senior safety engineer, Permanente Cement Co., Oakland, Calif.

Safety Incentives

E. C. Leonard, safety dir., Inland Steel Co., Ishpeming, Mich.

Industrial Hygiene Dust Elimination Methods and Equipment

John W. Warren, chief ventilation & industrial hygiene engr., Anaconda Co., Butte, Mont.

Silicosis Research

Henry N. Doyle, asst. chief, Occupational Health Program, U. S. Public Health Service, and Robert H. Flinn, chief, Division of Health, U. S. Bureau of Mines

12:15 P.M. LUNCHEON MEETING—Board of Governors, Western Division, American Mining Congress
Venetian Room, Ambassador Hotel

2:00 P.M. URANIUM IN THE FUTURE

Chairman: P. L. Merritt, senior geologist, E. J. Longyear Co., New York

Observations on Uranium and Nuclear Energy

Hon. Clinton P. Anderson, U. S. Senator from New Mexico

Canada's Uranium Program

William J. Bennett, pres., Eldorado Mining & Refining Co., Ottawa, Canada

Expected Future Uses and Consumption of Uranium Metal

Speaker to be announced

A Petroleum Company Looks at Uranium

Gerhard Herzog, director of research, Texas Co., Houston, Tex.

2:00 P.M. UNDERGROUND MINING

Chairman: A. S. Kromer, vice pres. & gen. mgr., Calumet Div., Calumet & Hecla, Inc., Calumet, Mich.

Mechanization at Indian Creek Mine of St. Joseph Lead Co.

Elmer A. Jones, div. mgr., St. Joseph Lead Co., Bonne Terre, Mo.

Shaft Sinking in Uranium Mining on the Plateau

Wm. H. Love, mgr. of mines, Hecla Mining Co., Wallace, Idaho, and Philip Lindstrom, supt. of Utah operations, Moab, Utah

The Koepe Friction Hoist

R. G. Schaal, chief mech. engineer, Cleveland-Cliffs Iron Co., Ishpeming, Mich.

Inclined and Vertical Shaft Sinking with the Cryderman Mucker

J. C. O'Donnell, development engineer, Shaft & Development Machines Co., Salt Lake City

Planing Phosphate Ore in Montana

F. E. Burnet, supt., Montana Phosphate Products Co., Garrison, Mont., and T. E. Howard, U. S. Bureau of Mines, Spokane

2:00 P.M. STRATEGIC MINERALS CONFERENCE

Presiding: S. H. Williston, vice pres., Cordero Mining Co., Palo Alto, Calif.; chairman, Strategic Minerals Committee, AMC

Speaker: Hon. Alan Bible, U. S. Senator from Nevada

Open Discussion

7:00 P.M. ANNUAL BANQUET

Embassy Room and Cocoanut Grove, Ambassador Hotel

Toastmaster: Hon. Goodwin J. Knight, Governor of California

Introduction of Distinguished Guests

Special Entertainment

FRIDAY, OCTOBER 5

9:30 A.M. TAX CONFERENCE (Open to tax accountants and attorneys and interested mining men) Conference Room No. 1, Biltmore Hotel

Chairman: Henry B. Fernald, chairman, Tax Committee, American Mining Congress

Discussion of pertinent features of Internal Revenue Code and the regulations thereunder, together with proposals for appropriate amendments to the Revenue Laws.

See you at Booth 125
American Mining Congress
Los Angeles, Oct. 1–4

Moly for the jet age travels on U. S. Conveyor Belts

Moly—the fabulous molybdenum that's used as an alloy to make high-temperature metal for jet planes, rocket nozzles, guided missiles.

And at Climax, Colo.—where a majority of the world's Moly supply is produced—just why do they use U. S. Rubber belts to convey a large part of the daily production of 30,000 tons from the crusher to the mill?

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So they picked the U. S. Ustex-Nylon belt—the belt that has *proven* itself above and beyond the call of duty in the roughest and toughest installations—year after year. *Ustex for strength, Nylon for flexibility.*

- **Not affected by corrosion.**
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And exclusive "U. S." Three-Way Engineering is available to you for any and all belt installations. "U. S." engineers, working closely with engineers representing the operator and engineers representing the conveyor equipment manufacturer, assure you of the *right* belt for lowest haulage costs. This service is obtainable through any of the 28 "U. S." District Sales Offices or by writing us at Rockefeller Center, New York 20, N. Y.

US RUBBER

Mechanical Goods Division

United States Rubber

Watch These Trends

James W. Franklin

HOT WIRE GALVANIZING process, reportedly developed in Italy, is said to be simple, low cost and radically different from conventional methods. Process saves time, labor, raw materials and power. No complicated equipment is needed, so it can be used to advantage by small companies. Only extra equipment needed is the electrical wire-heaters and a pyrometer.

Wire to be galvanized is heated throughout the process by alternating current. Wire goes through sodium hydrate degreasing and pickling. Heat of the wire warms up the solution, speeding up the pickling rate, and it seems that the presence of the electric current speeds up degreasing. Wire leaves degreasing and pickle tank covered with thin coat of caustic soda. Hot wire soon evaporates the water, leaving a thin inert coating of soda that prevents surface oxidation.

Now the wire temperature rises to 700 deg C and it enters the galvanizing tank, passing down through an inert layer of finely ground feldspar. Wire temperature on entry is above temperature of the molten zinc. When it comes out of the tank, the wire goes to coolers and winders. Six strands of wire (each 5,250 ft long) can be covered with 8 oz per sq ft zinc in less than an hour.

Process to galvanize six threads uses 10.5 kwh, 0.5 lb caustic soda and 4 lb zinc (zinc is 99.98% pure and the bath is diluted with 1% aluminum). According to the Italian magazine *Cazzaniga L*, it takes 29.6 kwh power to melt the metal needed to do the same galvanizing in ordinary galvanizing processes. Using caustic eliminates acid fumes in addition to preventing oxidation of the wire and cutting away grease.

HYDROGEN-REDUCED IRON is a step nearer commercial application. A method aimed at by-passing the blast furnace is past the semi-commercial stage at Hydrocarbon Research's Trenton, N. J. laboratory. Hydrocarbon and Bethlehem Steel Co. have their heads together and will consider putting the method on a bigger scale. Method calls for passing high-pressure hydrogen through powdered iron ore at 900 deg F.

Up in Stanford, Conn., Dorr-Oliver has its FluoSolids iron ore reduction method ready for a 25 tpd pilot plant.

Method reduces hematite to magnetite. Dorr-Oliver is reported to have a two-stage process in the laboratory that will reduce hematite to magnetite and then to metallic iron.

CALCIUM ALLOY in slug form may make it possible for cars to travel 20,000 miles without an oil change. Canadian Goverment National Research Council says that if the slug is put into the oil pan, it will help the oil retain lubrication properties as long as no foreign matter enters the block. During a 22,000-mile test run only a small amount of fresh oil was added to offset normal burning.

THERMENOL, A UNIVERSAL ALLOY, with some amazing properties has been developed by U. S. Naval Ordnance Laboratory. It uses no strategic metals. It is superior to alloys now being used for toaster units, hot plates and electric ranges. Alloy is 25% lighter than stainless, has better tensile strength at high temperatures. Corrosion resistance is good. It has good magnetic properties. This alloy may find new uses in corrosive, high-temperature area on jet engines. For more information check with Naval Ordnance Laboratory, White Oak, TIO, Silver Springs, Md.

FOUR-NINE ELECTROLYTIC ZINC can be produced from galvanizers' sal skimmings with method developed by Bureau of Mines. Sal skimmings do not respond to smelting or fuming. About 25,000 tons skimmings end up as low-cost zinc compounds each year. This electrolytic method in hydrochloric acid bath will put 90% of this material back in 99.99% pure zinc metal form. High current efficiency is obtained. Details can be had from Report of Investigation 5205, Electrolytic Recovery of Zinc from Galvanizers' Sal Skimmings. Write to Publications Distribution Section, 4800 Forbes St., Pittsburgh 13, Pa.

TEFLON makes a good bearing surface, according to R. J. Williams, vice president, American Metal Products Co., Detroit, Mich. American Metal has developed an automobile suspension joint, lined with Teflon. Bearing takes heavy loads easily and reduced friction by 50% in comparison with standard lubricated suspension joints.

In England, Edison Swan Electric Co., London, has perfected a method for metallizing the surface of Teflon, so it can be tinned and soldered to metal surfaces or rubberized for rubber to metal bonding.

ALUMAG FURNACE LINING is the newest ramming mix for high-frequency electric induction furnaces. New mix is high in fused alumina content. It is available in several types, each having varying magnesia content and grain sizes. Electro Refractories & Abrasive Corp., developed Alumag, stresses its use in stainless, high nickel and alloy steel furnaces.

A BRASS POWDER has been developed that may give a boost to the field of powder metallurgy. New Jersey Zinc and Armour Research Foundation metallurgists claim that gains in strength and hardness bring brass powder metallurgy parts closely in line with properties of wrought metal parts.

Armour metallurgists (Illinois Institute of Technology) tested about 100 combinations in a search for alloys for powder metallurgy applications that had desirable age hardenability characteristics. They sought an alloy hard enough for barrel finishing that was able to compete in hardness and strength with wrought metal products; hard enough to be used in new fields of powder metallurgy applications.

What has the strike done to Ryerson steel stocks?

In general, we are happy to report, our steel stocks are holding up very well—with the inevitable exception of structural and carbon steel plate inventories.

Because we entered the strike period with the largest stocks in the nation, we are still able to give quick shipment of almost every type of steel in normal warehouse quantities—even though we have not been able to replenish most stocks since before the strike began. And in some cases we can supply larger quantities to help you keep production going until your delayed mill shipments arrive. Here's a quick summary of the present status of Ryerson stocks for your guidance.

Sheet and strip—Cold rolled pattern-size sheets and coils stocks are excellent and galvanized stocks are good at most Ryerson plants. Some shortages have developed in our inventories of hot rolled sheets and coils, but when we cannot furnish exactly what you need, we may be able to supply a practical alternate from our inventories of special gauges and sizes. For example, we can sometimes furnish 13 gauge material when 12 or 14 gauge is not available.

Hot rolled carbon bars—Large overall tonnages on hand. Shortages are developing in a few sizes, but we can still take care of practically any hot rolled bar requirement.

Cold finished bars—Stocks more than adequate to meet current demand, both as to tonnage and range of sizes and types. Call us for any quantity of Ledloy, machinery steel, shafting, accuracy stock or other cold finished bar steel.

Tubing—In excellent supply. Seamless and welded mechanical and fluid power tubing, structural tubing and boiler tubes—all available in a full range of sizes, and in almost any quantity.

Alloy bars—Most all types in plentiful supply. Hot rolled alloys are not quite as plentiful as cold drawn—heat treated types not quite as plentiful as as-rolled—but we can almost always furnish your exact requirements or a practical alternate.

Stainless steels—Both straight chrome and nickel-bearing types are in good supply at Ryerson and can be furnished in almost any quantity. However, when your order for nickel-bearing stainless is covered by a rating, please be sure to extend it. You will be helping yourself by helping to assure future availability of these types from stock.

Structurals and plates—In tight supply for many months, these products continue to present the most difficult supply problem. However, check with us on your urgent requirements and we will help you if we possibly can.

Reinforcing steels—Most Ryerson plants are in a very good position to take on new reinforcing business—both re-bar and wire mesh.

Whatever your steel requirements, it will pay you to check with us. The nation's largest steel service organization is still your best source for steel of dependable quality, accurately cut and delivered to meet your schedule. As always, your inquiries and orders are sincerely appreciated.

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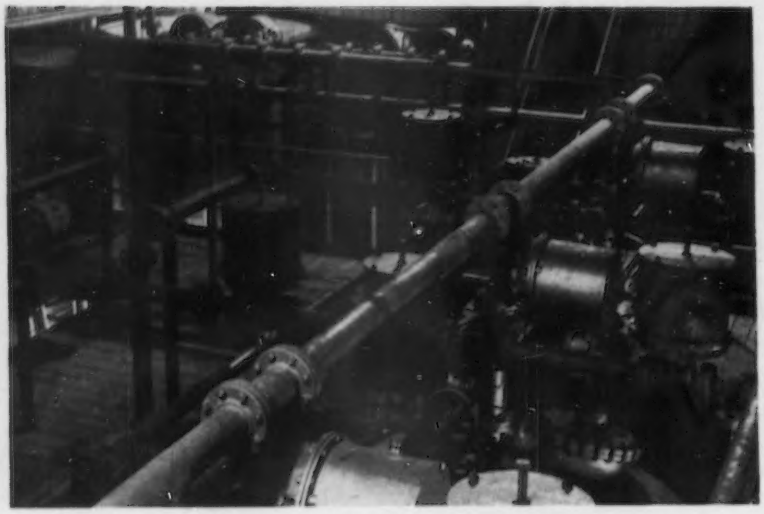

FIG. 7. Numerous control valves and a seemingly complicated system of pipe lines combine to make operation of an ion exchange plant fairly easy.

(Continued from p. 105)

cords and controls the volume and flow rate of pregnant solution fed to the columns. When the required volume has been fed, the transfer of columns is automatically initiated and completed through relays and solenoid valves which automatically close and open the appropriate valves.

Elution is based on using timers or counters at controlled flow rate for each step of the elution. Timers or counters can be easily adjusted to lengthen or shorten any particular step. A sequence timer automatically selects the proper units to undergo adsorption and elution. Alarms and interlocks assist the operator.

For most of the African and Canadian plants, the diaphragm motor operated on-off valves are spring closing and air opening. Air is admitted to the pneumatic diaphragm motors by solenoid valves which receive their impulses from timers or relays located in a central control cubicle.

Ion exchange plants are designed for considerable flexibility. By simple adjustment of the timers and flow rate control valves, by adding more resin to the columns, and by providing sufficient elution solution, it is possible to increase the plant capacity to handle an increase in the quantity of uranium to be picked up per day and/or increased pregnant liquor flow rate.

Economics

One encounters difficulty in attempting to specify ion exchange uranium recovery costs because these costs are dependent on factors which vary widely for different mills and different locations. Composition of the pregnant feed solution (particularly the uranium concentration), volumetric flow rate to be handled, type of eluting solution (chloride or nitrate elution), type of resin, degree of automatic operation employed, number of ion exchange columns per set, method of operation and equipment and chemical costs for the particular locality, all affect the ion exchange costs. Since these cost controlling factors differ from mill to mill, any generalization on capital and operating costs should be reviewed on the basis of the specific conditions existing for the mill considered. Therefore, only rough and approximate guides to these costs will be discussed here.

For a completely automatic ion exchange plant designed to recover 1 to 1.5 tons U_3O_8 per day and based on chloride elution, the delivered and installed cost for the equipment and the ion exchange resin would be approximately $200,000 to $250,000 per ton of U_3O_8 recovered per day depending on the factors mentioned above.

Little has been published on the costs of equipment or operation. Dasher has estimated that the investment costs for a plant recovering one ton U_3O_8 per day and handling approximately 1100 tpd solution to be $160,000 to $320,000 for the installed equipment costs plus another $54,000 for the resin. Total operating costs, assuming a five-year resin life and a 10% per year amortization rate, amounts to approximately 25c per lb U_3O_8.

Best alternate precipitation methods being developed when ion exchange was found applicable for uranium recovery were estimated to be equal to 50c to $1 per lb of U_3O_8 recovered or approximately 2 to 4 times the cost of the ion exchange process. Besides being a cheaper process ion exchange also gives a purer product (20).

Total RIP uranium plant costs are estimated by Bitzer to be roughly $5,000 to $6,000 per ton of ore processed per day or between $1.5-million to $1.8-million for 300-tpd plant. Direct operating costs of such a mill could be in the range of $15 per ton for a clean siliceous ore in an accessible location to as high as $25 per ton for a high lime ore in a remote place where power and water supply are not readily available (21).

Future of Ion Exchange

Within the next year or two, the large number of existing plants and those now being constructed will be producing many thousands of tons of uranium per year. With only a few exceptions, practically all of the uranium concentrates produced will have been adsorbed and desorbed on a strong base anion exchange resin. Alternate methods, particularly the solvent extraction technique which is now being developed, will receive due consideration but for the next 5 to 10 years the ion exchange uranium recovery process will continue to be the vital link in the processing chain.

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What are Your Fertilizer Plant Design Requirements?

PHOSPHORIC ACID

Dorr-Oliver designs plants for producing strong acid (32 to 33% P_2O_5) directly by its well-known process using the revolutionary new Dorr-Oliver Traveling Pan Filter.

DIAMMONIUM PHOSPHATE BASED COMPOUNDS

Dorr-Oliver designs plants producing directly from 32% P_2O_5 phosphoric acid a wide variety of compounds such as 14-14-14, 14-28-14, 12-36-12, 11-48-0, 16-20-0 and 18-48-0 as hard, uniform, free-flowing granules based on mono or diammonium phosphates.

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Dorr-Oliver designed vacuum evaporator stations eliminate serious scaling, reduce P_2O_5 losses to a negligible point and involve no fume problem.

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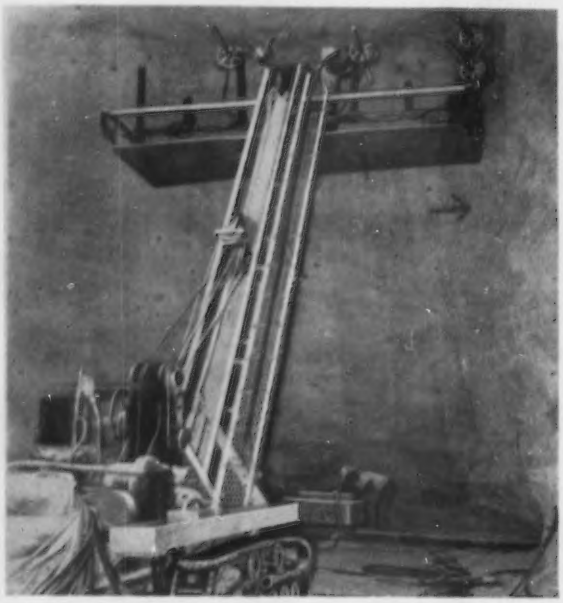
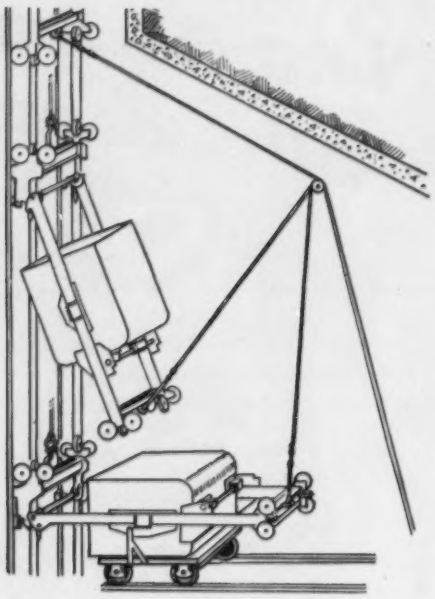
OPERATING IDEAS

Lloyd E. Antonides



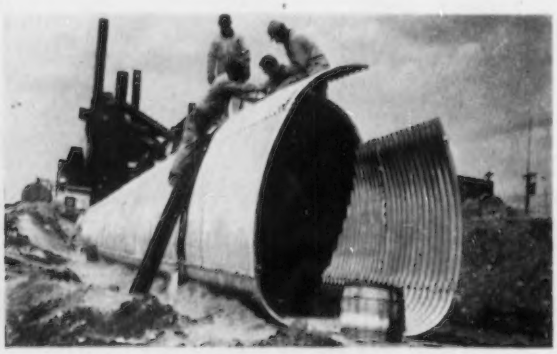
Jumbo Speeds Salt Mining

CRAWLER-MOUNTED, four-machine rig is elevated to drill entire 25-ft high face at Morton Salt Co.'s Weeks Island, La., mine. Kennametal FDL 1¾-in. drill bits are used with 1½-in. augers and Scranton drills to drill an average of 120, 8- to 10-ft deep holes per 50-ft wide face. Two-man crew reportedly drills 1½ faces per shift, including moving time. At base of face, Joy 7B1 shortwall machine is undercutting using Kennametal U-10 cutter bits. These cutter bits, originally designed for tough salt layer at base of potash bed, give coarser cuttings for reduced dust as well as other advantages, according to Wayne West, assistant mine manager. Feed on 7½- to 9-ft cutter bars is approximately 8 in. per minute. Rooms in tough but not extremely hard, massive salt dome, are to be benched out to height of 75 to 100 ft.



Device Aids Skip-Cage Change

BLAIR CROSSHEAD developed by Anglo American Corp. of South Africa and installed at all their Orange Free State mines, simplifies interchanging skip and cage. Crosshead remains attached to hoist rope, thus preventing any rope spin—serious in deep shafts especially. Lower part of bridle is integral part of cage and skip, thus eliminating extra weight and space, In step 1, hinged guides are opened, retractable auxiliary guide shoes are engaged, and locking device at top is opened. One end of a wire rope is attached to lower part of bridle and other end is anchored—length and position of pulley is designed to swing skip to correct position for removal as hoist rope is slacked-off. Lowering continues until skip slips off hooks on upper crosshead. Drawing is from "Optima" magazine published by Anglo American.



Versatile Culvert Pipe Is Used For Conveyor Set-Ups

THIS INCLINED CONVEYOR housing at Saxton Coal Corp., Somerville, Ind., was erected using Armco Multi-Plate pipe. It is 52 ft long and 126 in. in diameter. Other photo shows last stages of assembling "cattle pass" structure of Armco Multi-Plate at Allied Chemical & Dye Corp., Syracuse, N. Y. It will be used as aggregate conveyor tunnel receiving material from five superimposed silos. Feed will be controlled and selected by push-button.

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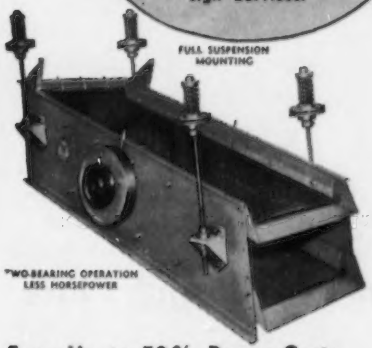

Save Up to 50% Power Costs with DENVER-DILLON Vibrating Screens

- Lower Power Cost with two-bearing operation and suspended assembly.
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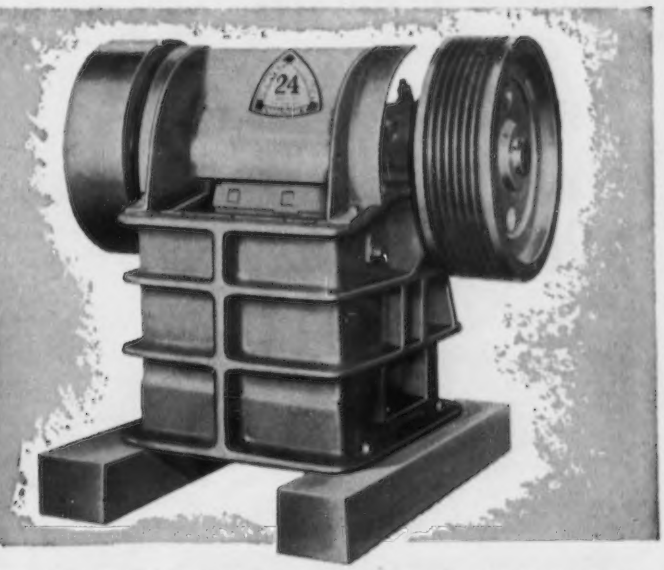
- Low operating cost.
- Rugged, simple construction.
- Sizes to 6′ x 14′, single or multiple decks.

For complete information, WRITE FOR BULLETIN NO. S3-B13.



DENVER FORCED FEED JAW CRUSHERS

Assure Long Life in Heavy Duty Operation

1. ANTI-FRICTION BUMPER BEARINGS

Pitman bearing troubles—the most serious problem with bronze bearing crushers—have been eliminated by using oversize, heavy-duty roller bearings for the Pitmans on Denver type "H" Jaw Crushers. Prices are comparable to all-bronze-bearing crushers.

Two types of crushers are available—type "H" has anti-friction bumper bearings and bronze side bearings. Type "J" has anti-friction bearings for bumper and side bearings. Available in sizes 5″ x 6″ to 36″ x 48″.

2. LONG-LASTING JAW PLATES

Genuine 13-14% manganese cast steel is used for jaw and cheek plates on Denver Jaw Crushers. Jaw plates are reversible so that service life is greatly increased and replacement costs cut.

3. HIGH STRENGTH FRAME

The steel frame of Denver Jaw Crushers is heavily reinforced to withstand more than the most severe service it will meet in its size reduction range.

For complete information about Denver Jaw Crushers, WRITE FOR BULLETIN No. C12-B12.

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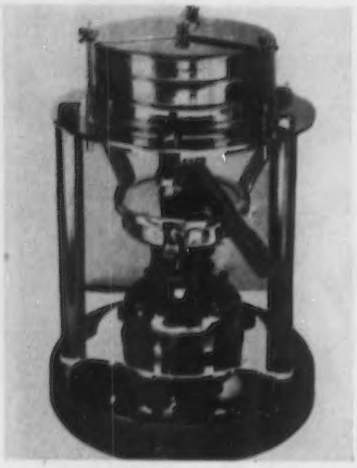


BENCH MODEL unit used in tests.

Sieving Can Aid Geologic Investigations

GRAIN SIZE ANALYSIS can often prove useful in geological investigations, according to Dr. Robert H. Cummings, Department of Geology, the University, Glasgow, Scotland. His work with a Russell gyratory sieving unit for laboratory shows that it makes the procedure fast and easy and that its efficiency as compared to visual microscopic counting in six tests was 98% and up.

Consolidated rock must first be crushed or chemically broken into component grains. If chemically disintegrated, loss in weight gives measure of cement present. For dry sieving sample must then be dried. A radiant heat oven was used, after which sample was placed in thin even layer on top screen and unit turned on.

Results of size separation can be applied in several ways. Variation in grain size of individual minerals frequently can serve as quick, simple assay method. Micro-fossils are usually separated and concentrated—being of some size other than rock grains—for closer study and stratigraphic correlation. Of course, grain size analysis itself can be used for correlation as well.

Wet sieving is done by spraying some lubricant, usually water or soapy water, through special top cover during sieving operation. Its advantages are: faster sieving; aids disintegration; protects fossils; and, if benzene or chloroform is used, it removes any heavy oil fraction present and gives cleaner particles for analysis.

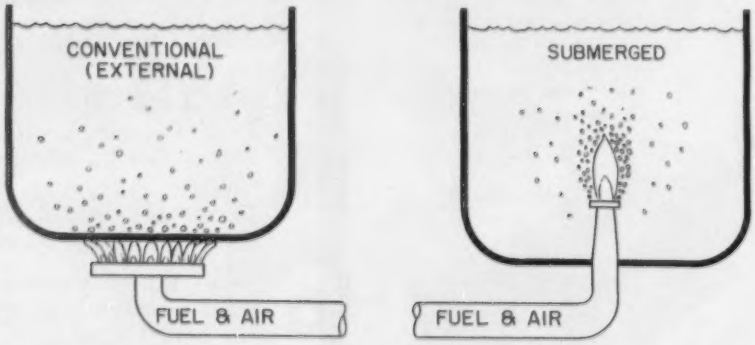
Nickel Alloy Blades Cut Slushing Costs

SAVINGS OF 22% are effected by use of nickel alloy steel slusher blades according to report in *Nickel Topics* magazine of International Nickel Co. Costs per ton of ore handled at Inco mines in Sudbury District of Canada, were $0.0027 for manganese steel blades versus $0.0021 for the nickel alloy ones.

A 4340 type nickel-chromium-molybdenum steel was tested against an austenitic 13% manganese steel for 37-in. slusher-scraper blades. They are 7 in. wide and 1 in. thick, made from rolled plate, normalized and tempered to hardness of over 300 Brinell.

Service comparisons of six blades in tons of ore slushed are:

	Mn	4340
No. 1	8,230	11,650
2	8,190	10,135
3	8,000	9,124
4	7,145	9,690
5	8,735	6,940
6	11,712	11,030
Average	8,670	9,770



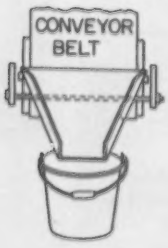
Submerged Combustion Cuts Heating Costs

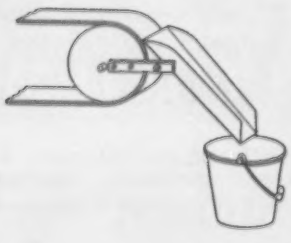
LOW FIRST-COST, high heat-utilization and minimum scaling and corrosion are advantages of submerged combustion. Simple in design and principle, it is suitable for almost any liquid heating application whether large or small.

Jefferson Lake Sulphur Co. has applied it to heating about 500,000 gallons of water per day for Frasch process mining. Comparative costs given are, per million Btu: submerged $0.621; gas-fired boiler $0.924; coal-fired water tube $0.925; oil-fired water tube $1.00; coal-fired fire tube boiler $1.32.

Other mining uses include salt production and potash concentration. Exhaust gases can be used to advantage in chemical reactions such as simultaneous evaporation and carbonation of solutions. They can also be used, as at Jefferson Lake, to drive gas turbine and preheat feed water.

Long used to heat acid baths in steel industry, scheme transfers heat directly to body of liquid through bubbles of hot gaseous combustion products. Transfer losses are eliminated and there are no surfaces to scale or foul.





Conveyor Sampler Is Simple

THIS SAMPLER DESIGN sent in by Charles Labbe, Las Vegas, Nev., uses two iron straps bolted to frame of belt conveyor feeder, as support. Sheet iron trough, hinged above center of gravity, is raised at lower edge by hand so upper edge touches belt and diverts ore stream into sample bucket. Releasing trough causes it to swing down vertically, out of the way. Supporting straps must be arranged so upper edge of sampler touches belt at flat tangent angle and above center of pulley to prevent catching.

Longyear

Longyear.... complete service to the mining industry

From advance reconnaissance to mine development... look to Longyear for complete service

DIAMOND CORE DRILLS

Research and development have put Longyear diamond core drills, equipment and supplies in demand by mining men everywhere. The Longyear Wire Line Core Barrel shown on this page is one example of Longyear's forward-looking policies in the development of drilling equipment.

CONTRACT DRILLING

High core recovery at minimum cost is the standard successfully maintained by efficient Longyear drill crews on the job. Exploratory drilling, foundation testing, soil sampling, and grout hole drilling are some of the services available to you through the Longyear Contract Drilling Division.

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Longyear's full staff of geologists and mining engineers can provide you with professional assistance in every phase of your operation—from advance reconnaissance to mine development.

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Using the Longyear Wire Line Core Barrel, this drill crew is able to obtain excellent core samples *without* pulling the entire string of drill rods after each core run. This drilling tool is revolutionizing exploratory diamond core drilling.

This Longyear contract drill team knows how to get good core samples with a minimum of time on the job. Highly trained Longyear crews using modern equipment are available for short or long-term drilling assignments in any part of the world.

These Longyear geologists are conducting a magnetometer survey. Longyear maintains a full staff of geologists and mining engineers to provide assistance as you require.

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T. D. Donoho (left), and T. D. Donoho, Jr., Partners, Donoho Foundry Co., Anniston, Alabama

"Our mining problem is solved, regardless of weather"

Since Donoho Foundry Co. of Anniston, Alabama, bought a CAT* D6 Tractor with No. 6S Bulldozer and backripper, its production of fire clay has increased nearly 50%. Dynamite, shovels and draglines, other bulldozers and front end loaders—no other equipment has been as successful as Caterpillar in handling this extremely dense, hard material. Even in wet weather the clay is hard six inches under the surface, and the sticky surface gumbo poses a traction problem.

"We've had only a measure of success with other equipment," says T. D. Donoho, Jr., a partner in the firm, "but with a D6 and backripper our mining problem is solved regardless of weather." The D6 and a Caterpillar HT4 Traxcavator* handle the entire output of 1200 cu. yd. of clay per week.

This is a new D6 Tractor, with rugged four-cycle Caterpillar Diesel Engine that develops an honest 75 drawbar HP. Its exclusive, Caterpillar-built oil clutch reduces the necessity for clutch adjustments, prolongs clutch life, and steps up operator efficiency for cost-cutting performance on tough mining jobs.

The new Caterpillar D6 Tractor is designed to outwork and outlast any other crawler in its class. Such features as simple and foul-free injection, "Hi-Electro" hardened track shoes, and highly effective filters and seals for engine and running gear keep the D6 on the job with minimum maintenance. This is only part of the D6 story. For details see your Caterpillar Dealer, who provides fast service and parts you can trust.

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

CATERPILLAR*

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NAME THE DATE... YOUR DEALER WILL DEMONSTRATE

Mineral Trading Feels Suez Pressures

NERVOUS EYES on Suez these days see oil. Following Egyptian president Nasser's nationalization of the canal, the Western World is first concerned with the flow of Europe's life blood—more than 80% of the East-to-West commodity trade through the canal is oil.

Yet there is another, broader concern underneath that heavy petroleum film: the $3-billion annual trade the U.S. has with Southeast Asia, a significant chunk of it in imports of strategic materials including metals and minerals needed for national defense. The great bulk of these imports comes via the Suez Canal.

Besides being our major source of supply of natural rubber, Southeast Asia sends us almost half our tin, a third of our manganese, substantial percentages of tungsten and chrome, some columbium-tantalum, beryllium, aluminum and copper scrap.

And this trade means even more to the U.S. State Department than it does to the Office of Defense Mobilization's strategic stockpile. For it is in Southeast Asia that many long-dominated nations are winning their national independence, in the shadow of Communist China and Russia. As an arena for what has been called the battle for men's minds, Southeast Asia takes on even deeper meaning.

The importance of Southeast Asian strategic commodity trade showed through last month in two developments that got little public attention:

(1) London commodity markets, and, as a result, world markets, shot into a flurry of price fluctuations—mostly upward, reflecting increased demand and at least a fear of shorter supply.

(2) U.S. defense mobilizer Arthur S. Flemming started studying the strategic materials which flow through the canal with an eye to possible new Government incentives to spur domestic production in the event the Canal should be choked off.

Nasser's move means more, too, than the possible stricture or closing of the Canal. To some observers in Washington, the tinderbox situation in the Near East could spread to the southeast under the banner of anti-colonialism. Recalling Iran's abortive nationalization of foreign petroleum interests five years ago, U.S. officials fear that nationalization could become a fad among the struggling, underdeveloped countries of Asia—affecting directly or indirectly the flow of strategic materials and their relationship with the West. For example, India's new five-year economic plan calls for a trend toward nationalization; Indonesia already has put its tin industry under state control and ownership.

What Flemming's office is trying to find out now is what all this means, and how serious a threat it could be to domestic defense and economic security. A look at such factors as domestic production potential, defense stockpile goals, and local Asian political and economic conditions strongly indicates a brighter picture than first meets the eye.

To get a perspective on U.S. trade with Southeast Asia in strategic materials, two hypotheses have to be set up:

(1) That the Canal be closed or severely restricted. In this event, Southeast Asian traders would obviously take alternative routes. As things now stand, most domestic imports from this area come through the Canal even when a Pacific Ocean route is shorter, because much of the cargo goes by commercial liners or tramps which stop off at various European ports on their way to New York from Asia.

Pacific crossings, or the long haul around the South African Cape of Good Hope would make some shipments uneconomic, thus reducing trade. No one in Washington, however, has yet figured out how much. That is one of the first things Flemming is looking at. Preliminary guesses are that the shipping delays themselves would not rock our defense preparedness.

Domestic stockpiles are filled with over half the items on the strategic material list, nearly filled with most of the rest, and stockpiling programs are sliding to a halt. Rubber, for example, is being acquired on a replacement only basis, and the delay of some two weeks that would be caused by alternate shipping routes would not be serious.

(2) That materials industries in Southeast Asia be nationalized. This would pose deeper problems. If worse came to worst, and the U.S. were entirely shut off from Asian trade, many observers feel we could turn to other sources—such as Africa, which already supplies much of our minerals and metals imports; or South America, whose minerals industries are booming.

Particularly, the Administration would then be likely to ask Congress for more incentive programs for domestic minerals producers. Some U.S. producers of strategic materials already have new help from extended Government purchase programs in tungsten, manganese, and others. New tax help for plant expansion in titanium and columbium-tantalum is in the works. Interior Department's Bureau of Mines is aiding in exploration and development, and the Atomic Energy Commission is turning more to private expansion in uranium.

Domestic minerals producers for years have been fighting for continued Government aid on just this ground—the chance foreign supplies are cut off. The Senate Interior Committee mining hearings held last session and in previous sessions by Chairman James Murray (D-Mont.) and ex-chairman George E. Malone (R-Nev.) have plugged for more U.S. self-reliance in metals and minerals.

But this is the point where the State Department injects a broader note of over-all foreign economic and political policy.

It is State Department's aim to make sure the U.S. is not cut off from Southeast Asia—either economically or politically. The argument to both Southeast Asian nationals and domestic skeptics is this: we need Asia and Asia needs us. Our policy is to encourage development of local foreign natural resources, stimulate trade, help where possible free enterprise. Only by a strong economy in Asian nations can the U.S. win them to democracy, or at least reduce the danger of their adopting Communism.

This policy means some things not too palatable to domestic industry. It means low tariffs, although Asian imports of strategic materials are the same as any other foreign country's. It means more bartering of U.S. agricultural surpluses for foreign strategic materials, though these are frozen in a supplemental stockpile. It means continued U.S. technical and economic aid to underdeveloped countries, though defense purchase contracts for new foreign minerals production are no longer being negotiated.

It means encouragement (and protection) of U.S. investment in Asia, though mining investment now is only about $45-million—a drop in the bucket compared to investment of U.S. money abroad in other fields. It means assurance to Asian countries that the U.S. will continue to be a market for them even if they should nationalize or tend in that direction. Their local government controls on industry are tighter than ours or other foreign nations' even now, because the free enterprise business class in Asia is not traditionally the respected group it is here. And even under Government control or ownership, Asian industries need markets.

This friendly policy toward Asia, on long term, is the best possible assurance the State Department feels it can give U.S. industry and business of continued health and growth. Because, most government officials agree, an enemy Asia could mean the beginning of the end.

USBM Announces Method For Cb-Ta Separation

Bureau of Mines has come up with what it terms a "revolutionary new method" for recovering columbium and tantalum from ores, concentrates, and smelter slags. USBM says several private com-

panies in the U.S. and abroad are ready to use it on a commercial scale.

Technique involves organic chemical solvents to separate the columbium and tantalum, long inseparable. The combined metal ores or concentrates are dissolved in a solution of hydrofluoric acid and hydrochloric acid, then washed over with methyl isobutyl ketone. The latter extracts the tantalum, leaving the columbium.

Using the two solutions on the separate metals yields oxides of better than 99% purity, USBM reports, from which metal recovery is "no problem."

Late Developments

INTERIOR DEPARTMENT'S Bureau of Mines says new Congressional appropriations will let it intensify new metals and minerals research. The funds total just over $22-million, for field studies, experiment stations, and experimental laboratories.

●

CONVENTION PLATFORMS aren't confined to the political parties. American Mining Congress has set up a nationwide committee to draft a declaration of policy of "the mining industry's views on national issues of major importance to the industry." A report will be filed at the AMC annual convention in Los Angeles, October 1-4 (see p. 000). General subject areas include: General policy; labor relations; taxation and Government expenditures; gold, silver, and monetary policy; tariff, stockpiling, and mineral programs; public land policy; mine financing; social security; water and air polution; mine safety; government reorganization; uranium; and solid fuels. Kenneth C. Kellar, attorney of Lead, S.D., is chairman of the resolutions committee.

●

PERSONNEL change in government — Assistant Interior Secretary Wesley D'Ewart, whose public lands policy ran into stiff Congressional opposition, has left the department after the Senate failed to okay his appointment. D'Ewart has been transferred to agriculture department.

●

SOUTH AMERICAN metal and mineral expansion is going full tilt—both under U.S. and local foreign mining companies. Some recent examples cited by Federal Maritime Commission in hearings on commercial shipping companies' requests for mothballed freighters: Anaconda Copper is sinking $52-million into an El Salvador, Chile, copper mine. Southern Peru Copper Corp. is developing new inland mining operations port at Ilo, Peru. Chilean copper and nitrate industries are expanding, latter just got export-import bank help.

The over-all movement of ores and concentrates from South American mines to the U.S. has boomed.

John C. L. Donaldson

Labor This Month

LEGAL STRINGS EASED ON LEFT-WING UNIONS: The anticipated onslaught on alleged Communist-dominated unions by the Federal Government has lost more ground. Recent decisions by the National Labor Relations Board and the courts have cut back further the authority of the Federal Government to control these organizations. The latest moves follow a pattern of the past several years which has nullified the NLRB's control over the non-Communist oath. In essence, the rulings add up to a lack of tough legal authority to police labor unions where the Communist issue arises.

Two recent decisions, while not involving the International Mine, Mill and Smelter Workers Union, have an important effect on its future. Here's what the rulings say:

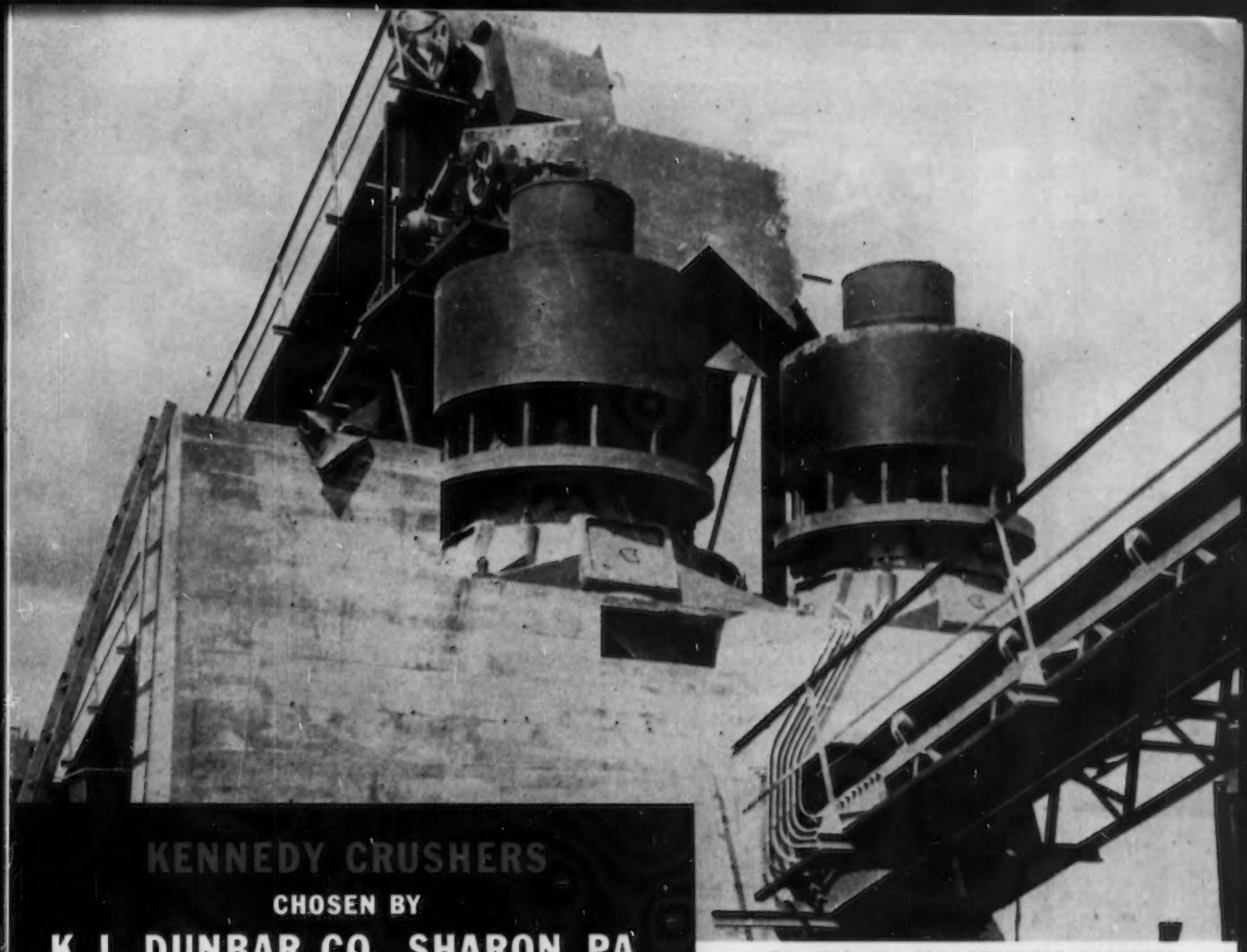
- The NLRB will not hold up charges filed against an employer by a union facing a suit before the Subversive Activities Control Board. The Board says the fact that a union is accused by the Government of being infiltrated by Communists is not sufficient to bar it from using the Board processes. In this one an employer had urged the NLRB to stall its decision on an unfair labor practice charge—filed by the United Electrical Workers—until the SACB had ruled on the electrical union's case. Mine-Mill is in the same position before the Subversive Controls Board; accused by the Government of being Communist-infiltrated.
- The U.S. Court of Appeals holds that an employer cannot challenge the alleged falsity of the Taft-Hartley non-Communist oath filed by a union. The court says that the employer may present evidence to the National Labor Relations Board, which administers the oath, charging that a union did not locally file. But to claim that it was falsely filed makes this a matter of criminal prosecution that is outside the NLRB's jurisdiction.

OVERTIME—AN EMPLOYMENT TIPOFF: A new statistical series is being developed by the Government to preview trends in employment. On the theory that many employers cut back overtime schedules before laying off workers, and add overtime work in a period of expanding production, Government economists are now taking a monthly check of hours worked. This way, they hope to forestall any sharp unemployment by looking in the overtime crystal ball. A sudden drop could bring economic needles in the form of defense contracts and the like.

Primary metals are part of the monthly survey. Copper and other nonferrous mining employers might keep a close check on the overtime report published by the Labor Department's Bureau of Labor Statistics. First returns show a slight overtime drop in primary metals—from 41.2 hours in April to 41 hours in May. Overtime average for each month was 2.8 hours. This compares with the year's highest monthly average so far, recorded in January, with a total of 41.9 hours per week, of which 3.5 hours were overtime work.

LABOR LEGISLATION OF THE FUTURE: Organized labor's drive for new or rewritten labor laws is already being shaped for the next Congress. With both Democratic and Republican political planks more liberal than ever, as far as unions are concerned, labor leaders will demand that these pledges be fulfilled—no matter which party wins the election. If the strategy is successful, it will be the first time in a decade that any wholesale review of labor laws is made in Congress.

The record of the last Congress on matters of labor's particular interests is almost nil. No major bills were passed, even though in some cases the Eisenhower Administration and the unions jointly supported them. Some of the programs which fell by the wayside will be resurrected next January. Watch for these key drives: extension of the minimum wage law, aid to depressed areas, Federal control of health and welfare programs. Another pitch will be made to revise the Taft-Hartley Act, particularly to bar the states from outlawing the union shop through "right to work" laws. T-H hasn't been touched in recent years, partly because the unions haven't wanted to take chances.



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On a Basis of Proven Performance

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KVS CRUSHERS HAVE AN ESTABLISHED REPUTATION FOR HIGH OUTPUT, LOW POWER AND MINIMUM MAINTENANCE.

Whether it's Taconite, Slag, Dolomite, *any hard-to-crush rock or ore,* you can depend on KVS Crushers to produce peak capacities and lower your operating costs. A complete range of sizes available in primary and secondary stage crushers.

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- Preheaters, Deheaters
- Steam Generators
- Belts, Conveyors
- Pneumatic Transport Systems
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- Pulverized Coal Firing Systems
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- Complete Lime Plants
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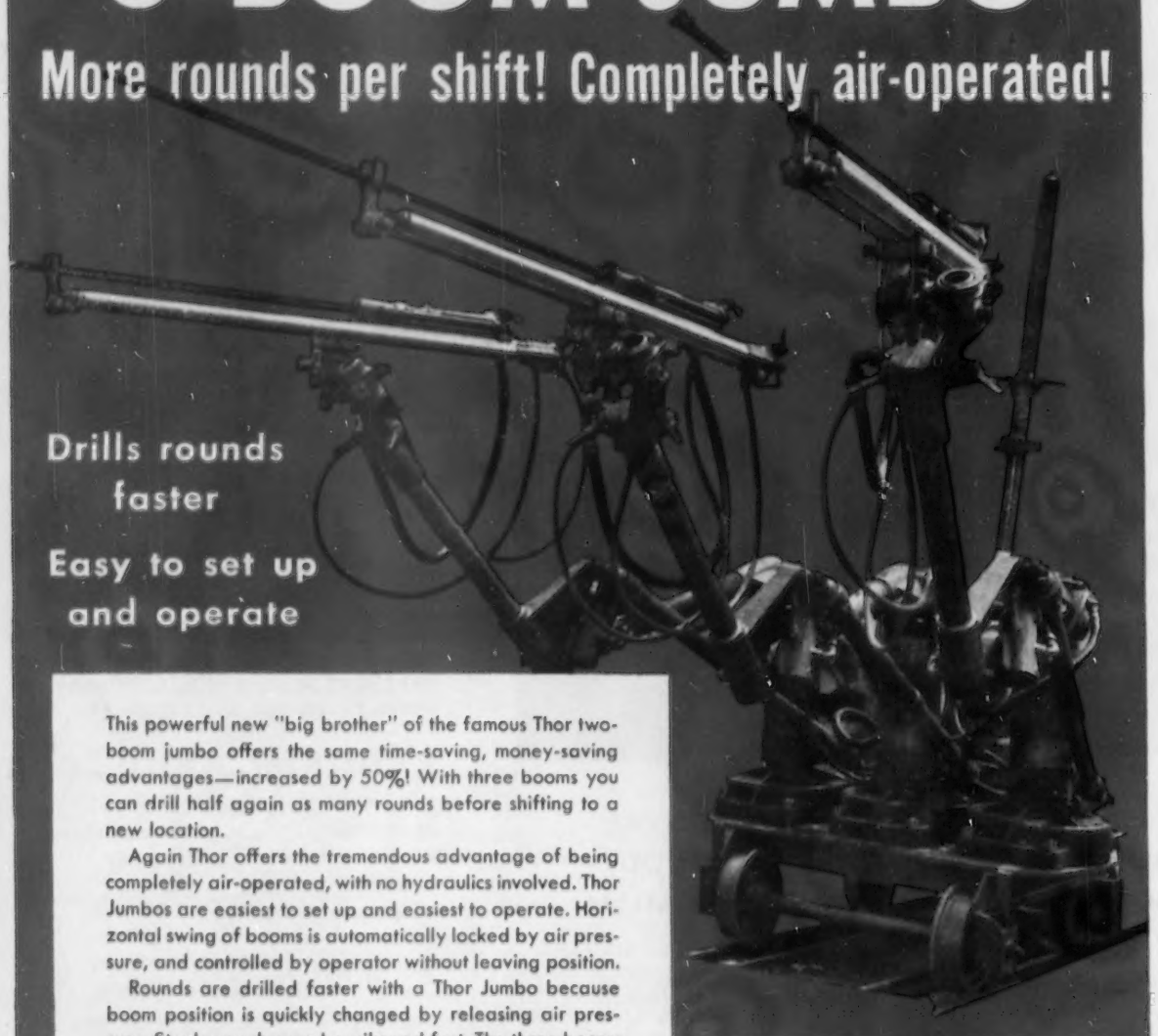
GREAT NEW THOR 3-BOOM JUMBO

More rounds per shift! Completely air-operated!



Drills rounds faster

Easy to set up and operate

This powerful new "big brother" of the famous Thor two-boom jumbo offers the same time-saving, money-saving advantages—increased by 50%! With three booms you can drill half again as many rounds before shifting to a new location.

Again Thor offers the tremendous advantage of being completely air-operated, with no hydraulics involved. Thor Jumbos are easiest to set up and easiest to operate. Horizontal swing of booms is automatically locked by air pressure, and controlled by operator without leaving position.

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THE SHORTAGE OF SCIENTISTS AND ENGINEERS:

What Caused It?

WHY is the United States confronted with a serious shortage of scientists and engineers?

One reason, discussed in earlier editorials in this series, is that the increasingly complex technology needed for national security and for an expanding economy has raised enormously the demand for technically trained people.

But it is clear also that too little has been done to increase the supply of scientists and engineers and to make most effective use of the limited number now available. It is with this second reason for the shortage that this editorial deals.

Too few bright young people have been attracted to careers in the sciences and engineering. Many with technical training have been leaving these professions, with the exodus from teaching being especially alarming. And the technical talent now employed in industry, government and education is, in too many instances, being utilized less effectively than it might be.

Paying for a Miscalculation

A legacy of the depression provides part of the explanation for the current shortage of young people entering scientific and engineering careers. Because of low birthrates in the 1930s, there are now about one million fewer boys and girls of college age than there were in the early 1940s. Not until 1960 will there be as many in the 18-21 age group as in 1945. And from the brightest young people of these ages must come, not only scientists and engineers, but the new members of all the professions needed by our growing economy.

A miscalculation in the late 1940s, when our future needs in various occupations were being gauged, provides another part of the explanation. Occupational counselors and high school students were advised that, because of heavy postwar enrollments in engineering and other technical fields, "it is likely that the shortages of trained men will be alleviated in a few years."*

Instead of being alleviated, however, the shortages became more acute. Job opportunities grew rapidly, while graduating classes dwindled. Fewer than half as many students received degrees in engineering in 1955 as in 1950, the peak postwar year. The trend has been reversed, but graduating classes will not be large enough to narrow the gap for several years.

Lost Talent

Beyond these temporary conditions, there is another explanation for the failure of the number of scientists and engineers to keep pace with our rising needs. This is the staggering loss between high school and college of young people with the talent to be successful in science and engineering. **Last year between 60,000 and 100,000 high school graduates of college ability failed to enroll in college for financial reasons and perhaps an additional 100,000 did not enter college because of lack of interest.†**

Of the most intelligent 20 percent in the group of college age, fewer than half enter college and only about a third graduate from college. Educational authorities estimate that fewer than 2 percent of those in the college age group who are mentally equipped to obtain Ph. D. degrees will actually obtain such degrees.

Another crucial stage is in the high

*U. S. Bureau of Labor Statistics, *Occupational Outlook Handbook* (Bulletin 940), p. 63.

†Charles C. Cole, Jr. (assistant dean, Columbia College, Columbia University), *Higher Education*, November 1955.

schools, where future scientists and engineers receive their first training in science and mathematics. There are serious weaknesses and signs of deterioration in this vital part of our educational system.

One-quarter of all American high schools offer no chemistry or physics. One-quarter offer no geometry. In many of the schools offering science and mathematics courses, the quality of instruction is low. Last year in the New York City school system alone more than 10,000 students were in science classes taught by teachers who were not trained in science.

This is a situation that threatens to become much worse. Between 1950 and 1955 the number of graduating teachers qualified to teach high school mathematics dropped 53 percent and those qualified to teach science dropped 59 percent. Furthermore, only about 60 percent of the graduates certified to teach mathematics or science in 1955 entered teaching as a career.

On the students' side — partly because of inadequate guidance programs — there has been a drift away from science and mathematics courses. The result of low student interest, and poor high school programs, in science and mathematics is virtually to foreclose careers in science and engineering to many bright young people. They miss the necessary basic training. Many who do attempt to obtain college training in these fields are ill-equipped. Engineering school deans report that fully half of their students enter with deficiencies in mathematics.

Misuse of Trained People

Scientific and engineering careers have long had a reputation for low salaries and limited opportunities for advancement. In recent years starting salaries have sky-rocketed and have been accorded wide publicity. But unfortunately there has been much less improvement in the salaries paid experienced engineers and scientists, especially in government and education. This has lowered the morale of experienced men and provided an incentive to desert engineering and research positions for higher paying jobs in sales or management.

Engineers and research scientists complain also that too much of their time now is spent on tasks that draftsmen and technicians could perform. Unfortunately for easy solution of this problem, however, there is an acute shortage of technicians as well. Worse still, there are indications that some companies in industries using large numbers of engineers have gobbled up technical manpower at a faster rate than they can effectively employ these scarce people.

Another drain on the supply of newly-trained scientists and engineers is military service. About 8,000 of this year's 27,000 engineering graduates were in ROTC programs and committed to active duty after graduation. Dr. A. W. Davison, chairman of the Engineering Manpower Commission of the Engineers Joint Council, says that in most cases no attempt is made by the Armed Services to assign these young officers to duties for which their engineering education specifically prepared them. They are not only withheld from industry and education for two years but also are not utilized in defense programs requiring more engineers and research scientists.

Some of the causes for the present shortage of scientists and engineers — bad advice a few years ago and a college age group held down by depression birthrates in the 1930s — are gradually being overcome. But others, such as the deterioration of science and mathematics training in our public schools and the many instances of ineffective utilization of scarce technical talent, enjoy no such prospect of automatic correction. The final editorial in this series will deal with some practical suggestions for meeting these problems.

This is one of a series of editorials prepared by the McGraw-Hill Department of Economics to help increase public knowledge and understanding of important nationwide developments of particular concern to the business and professional community served by our industrial and technical publications.

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Donald C. McGraw

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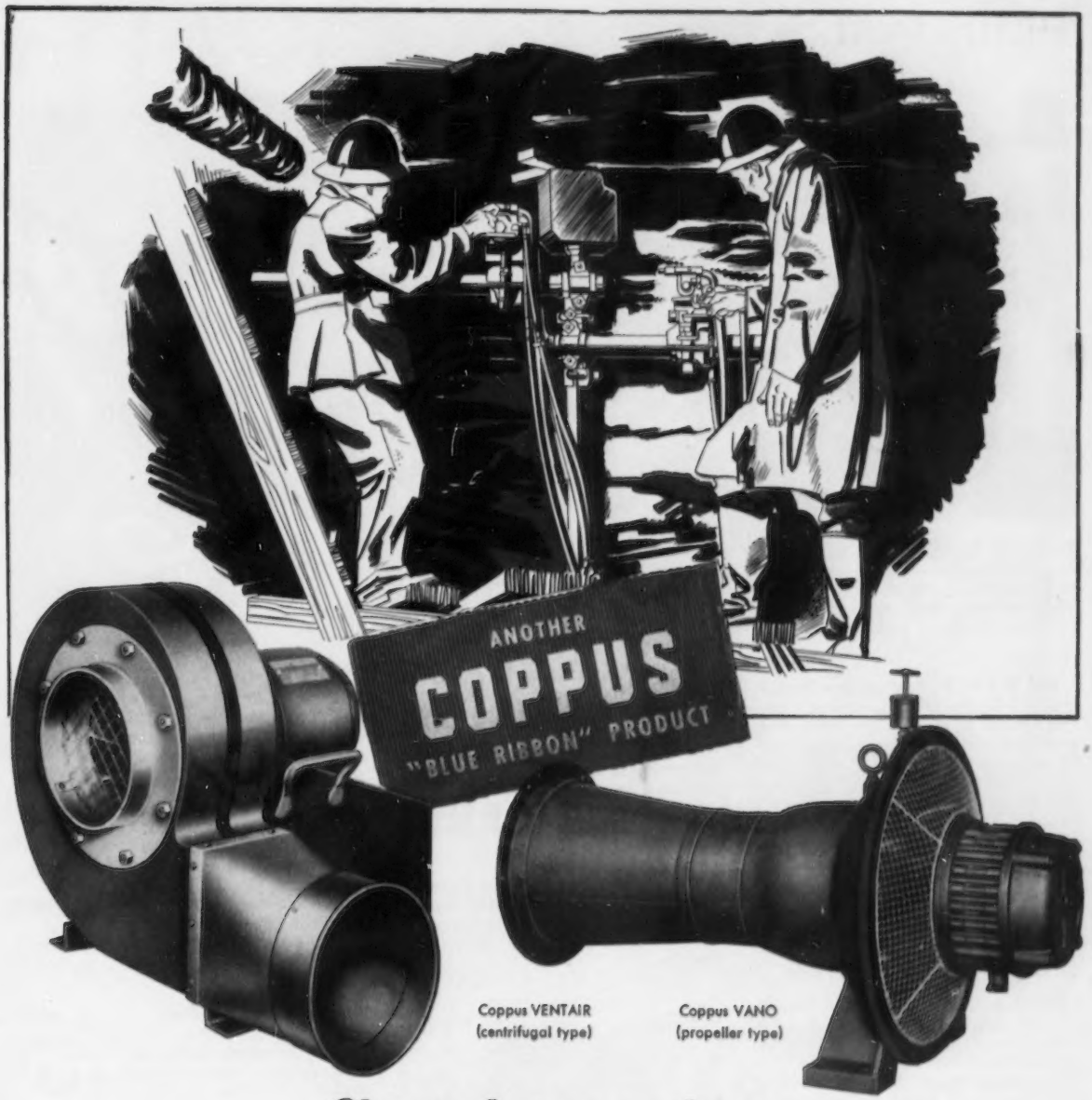

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PERSONALS

GEORGE B. BLONSKY, mining engineer devoting his career to metallurgical and chemical operations in western U. S. and abroad, has been named project engineer for F. H. McGraw & Co.

Dr. Hobart E. Stocking has been reassigned to the Grand Junction Operations Office of the AEC as chief of the geological branch. For the past 18 months he had been with the exploration division of AEC's Washington office. Prior to that he was assistant chief geologist at Grand Junction.

William Bell-Taylor has been named director of industrial relations for Cerro de Pasco Corp.'s Sierra division, with headquarters at Oroya, Peru. Mr. Bell-Taylor, a Peruvian citizen, joined Cerro de Pasco in 1952 as industrial relations assistant for the Sierra division.

Oliver Iron Mining Division has announced three new appointments at its Duluth general office: **Gordon T. Bethune** was appointed supervisor, cost and statistics; **John J. Specht** was named assistant supervisor, cost planning and analysis; and **Ralph C. McBride** became assistant supervisor, statistics.

Donald G. Brower has been named acting manager of the research and special products divisions of Victor Chemical Works, a major producer of phosphorus, phosphates and other industrial chemicals.

Ellsworth Y. Dougherty, mining engineer for the SEC in the Western states, is now headquartered at Room 339, 821 Market St., San Francisco 3, Calif.

National safety awards were presented to two departments and one individual employee at Kennecott Copper Corp.'s Chino Mines Division, Santa Rita, N. M. **Frank Brown,** general foreman at the division's smelter, received the award for having "worked 47 years around a copper smelter without having a lost time accident." The division's blacksmith shop and power plant also received the Joseph A. Holmes Safety awards.

William C. Campbell, formerly with Vitro Corp. and the U. S. AEC, has been appointed manager of the newly established New York offices of Utah Construction Co., located in the Empire State Building.

Joseph Cooper of Monticello, Utah, one of the former owners of the famed Happy Jack mine, has been named chairman of the board of directors of Mountain Top Mining & Milling Co. Mr. Cooper succeeds **James McRae,** head of McRae Oil & Gas Corp.

Dr. J. D. Forrester, dean of the University of Idaho College of Mines at Moscow, and director of the Idaho Bureau of Mines and Geology, has resigned to accept similar posts at the University of Arizona. Dr. Forrester joined Idaho in 1954 after 10 years as chairman of the mining engineering department at the University of Missouri. He had headed the department of geology at the University of Idaho from 1939 to 1944.

D. W. Pringle, formerly mine superintendent at the Copper Mountain operation of Granby Consolidated, has been promoted to general superintendent. He will now oversee operations at Copper Mountain, Allenby and Princeton. **G. F. Carmous,** formerly assistant mine superintendent, now becomes mine superintendent in charge of all mining operations at Copper Mountain.

Rowland K. Wall has been elected assistant secretary and assistant treasurer of American Zinc, Lead and Smelting Co. at a recent board of directors meeting.

G. H. TURNER has been named senior research engineer with Consolidated Mining & Smelting Co. at Trail, B. C. He joined Cominco in 1944 after brief service with the B. C. Department of Mines.

J. C. KINGSBURY, vice president of F. E. Schundler & Co., Inc., Joliet, Ill., has been elected president of the Perlite Institute, national trade association of the perlite industry.

John W. Hall, sales vice president, was elected director and member of the executive committee of Potash Co. of America, with headquarters in Denver, Colo. He fills the vacancies caused by the death of **George E. Pettit.**

Thurman E. Jackson has been named chief of the Audit Branch, Grand Junction Operations Office of the U. S. Atomic Energy Commission. He has been with with the AEC for 5 years. **Eston B. Stephenson** has been named to the staff of the assistant general counsel of the Grand Junction Operations Office. He spent 3 years with the AEC at Oak Ridge.

Elton A. Youngberg, formerly director of the mining division, AEC Grand Junction Operations Office, is now assistant manager for operations. **Walter B. Carlson,** formerly finance division director at Grand Junction, is now assistant manager for administration.

Dr. Donald L. Everhart, previously acting chief of the Denver exploration branch, AEC, now is geological advisor to the division of raw materials with headquarters in Denver. He reports directly to **R. D. Nininger,** assistant director for exploration.

C. E. Tonry, formerly director of the processing division at Grand Junction Operations Office, AEC, was named director of the new concentrate procurement division.

Robert Hawkinson has recently been promoted to assistant chief ore grader for the Hibbing-Chisholm district of Oliver Iron Mining Division.

Norman E. LaMond, secretary and treasurer of Shattuck Denn Mining Corp., has retired after more than 50

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PERSONALS *(Continued)*

ROBERT J. LINNEY has been named vice president in charge of operations of Reserve Mining Co. He has been manager of operations since he joined the company at Babbitt, Minn., in 1950.

years of service with the company and its predecessor, the Shattuck Arizona Copper Co.

Herbert Hoover Jr., Under Secretary of State, has been awarded the Hoover Medal for 1956, one of the engineering profession's most distinguished honors. The medal, named after former President Hoover, its first recipient, is awarded by engineers to a fellow engineer for distinguished public service.

Wayne Manson, former personnel director, Consolidated Coppermines Corp., Kimberly, Nev., has been appointed chief accountant, succeding **E. C. Wharton,** resigned. **Jim Long** of the accounting department, has been named to succeed Mr. Manson as personnel director.

W. A. Griffith, former assistant mill chief, has been named chief of milling and maintenance, Bertha Mineral Division, New Jersey Zinc Co., Austinville, Va., succeeding **K. C. Apland,** who has been transferred to the Western operations of the company, and **J. E. Higgins,** who resigned.

William A. Bowes, project geologist for the Salt Lake exploration branch of the AEC and chief of the AEC's exploration office at Bakersfield, Calif., is being transferred to Santiago, Chile, to help that country with its raw materials program. **Richard Miller,** assistant chief of the exploration office at Phoenix, Ariz., succeeds Mr. Bowes at Bakersfield. **Art Richards,** geologist at the AEC's Las Vegas office, will be temporarily assigned to the Bakersfield exploration office.

Donald B. Gillies has fully retired from active service after almost 50 years with Republic Steel Corp. and its predecessor, Corrigan, McKinney Steel Co. Mr. Gillies was a vice president of Republic Steel until his 75th birthday in 1947 when he was relieved of his responsibilities as an officer of the company but continued as a mining consultant. Mr. Gillies was at one time president of the American Institute of Mining, Metallurgical and Petroleum Engineers, and of the Lake Superior Iron Ore Association. Within the past two years, he has been instrumental in exploring an important deposit of rutile, a titanium-bearing ore, in southern Mexico for the company.

Thomas W. Mitcham, mining geologist, has resigned from his position as exploration manager for International Ranwick, Ltd., and has established consulting offices in Flagstaff, Ariz.

E. J. Gorman has resigned as vice president and general manager of Yuba Consolidated Gold Fields, San Francisco, Calif. He has also resigned as executive vice president of Yuba Manufacturing, and as president of Portuguese-American Tin Co., subsidiaries of Yuba Consolidated Gold Fields. He will continue as a director of these concerns. **W. P. Blanchard** has been named vice president and general manager of Yuba Manufacturing Co.

Lawrence Hansen has been appointed safety engineer of American Smelting & Refining Co.'s northwest mining department at Wallace, Idaho. He is a graduate of the University of California in mining engineering and joined the Asarco staff late in May, coming from Banner Mining Co. Prior to that he was with Day Mines Inc.

Charles J. Hodge has been named director of employee relations, Sierra division, Cerro de Pasco Corp., Oroya, Peru.

F. R. Jones has been appointed general superintendent of the MacIntyre development of National Lead Co. in Tahawus, N. Y., which mines and concentrates ilmenite ore. Succeeding Mr. Jones as mine superintendent, is **Walter M. Chapman,** former assistant mine superintendent.

E. M. Lindenau has completed his contract as manager of Companion Minera Choco Pacifico, one of the largest gold dredging companies in the world, and is returning to the U. S. by way of Mexico. His permanent address will be in Tucson, Ariz.

Paul Lemke, metallurgical engineer at Kennecott Copper Corp.'s Chino mill, will present a paper on the use of cyclone thickeners at the American Mining Congress convention in Los Angeles, Oct. 1-4.

J. B. Knaebel, manager of New Mexico operations for Anaconda Mining Co. since 1951, has been named assistant to **R. S. Newlin,** vice president in charge of mining operations. In addition to other duties, Mr. Knaebel will be responsible for general direction of Anaconda's uranium operations. Other personnel changes

MARLING J. ANKENY, whose nomination was confirmed by the Senate on July 19, is the 10th Director of the U. S. Bureau of Mines succeeding J. J. Forbes who retired last November.

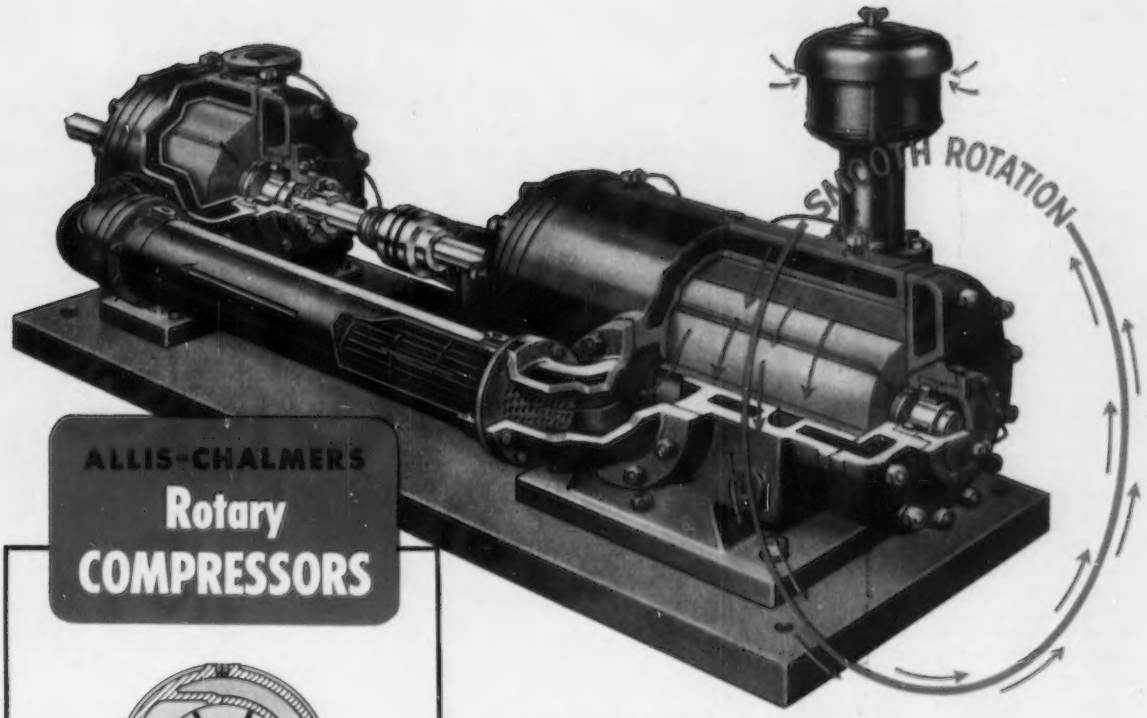
recently announced by Anaconda include: **A. J. Fitch,** formerly assistant manager of the Bluewater operation, promoted to manager of New Mexico operations; **E. C. Peterson,** formerly general mill superintendent, promoted to assistant manager under Mr. Fitch; **F. J. Balentine,** mine engineer, promoted to assistant mine superintendent at the Jackpile mine; and **H. A. Mace,** cost engineer, promoted to planning engineer.

William G. Maloney has been appointed secretary-manager of the Mining Association of Montana, succeeding the late **Carl J. Trauerman.** After attending the Montana School of Mines for two years, Mr. Maloney worked as a mine shift boss and mining safety engineer. Since 1953, he has been on the staff of Sen. James E. Murray.

Herbert F. Byrne has been appointed vice president of production planning, and **Louis J. Rohl** has been named vice president and chief metallurgical engineer of United States Steel Corp. Both are newly created positions. **Joseph M. Greer** has been promoted to general manager-production planning for the corporation.

H. S. Spaulding has been appointed general staff metallurgist for Kaiser Aluminum & Chemical Corp.'s fabrication division. **J. A. Ketchum** has been named to succeed him as technical superintendent at the Newark, Ohio, plant.

Ralph W. Neyman, former general manager of Hecla Mining Co., has been named president of Federal Uranium Corp. **W. H. Love,** manager of Radon mine, was named manager of mines succeeding Neyman. **Phillip Lindstrom,** chief engineer at Radon, was named manager of that property. Mr. Neyman served as



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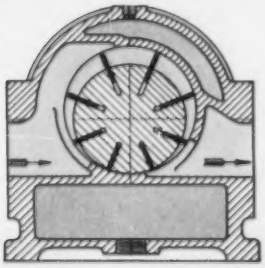

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mining engineer, assistant chief engineer, general mining superintendent and general manager of Hecla. He has been general manager since 1951. Mr. Love, a graduate of Montana School of Mines, worked with Sink Float Co. as metallurgist before joining Hecla 8 years ago.

Robert May, former chief engineer for Pend Oreille Mines & Metals Co. at Metaline Falls, is now mining engineer for the Bureau of Land Management in Spokane, Wash. He will check applications for mining patents on public domain, make appraisals and aid in resolving conflicts over lands requested by the state.

Charles A. Mitke is at present in the Philippines developing lead and copper properties. His address is care of the Manila Hotel, Manila, P. I.

R. W. Shilling has been appointed industrial engineer at Kennecott Copper Corp.'s Chino mine. He was formerly general drilling and blasting foreman. **David McNaughton** was promoted from churn drill foreman to Shilling's former position.

Douglas Munroe has been appointed assistant to the executive vice president of the Anaconda Company. In addition to his other duties, Mr. Munroe will have charge of the personnel department of Anaconda and its subsidiary and affiliated companies.

R. L. Johnson has been named safety engineer at the Hurley plant of Kennecott Copper Corp's Chino Mines Division. **Thomas Hill** was named industrial hygiene engineer succeeding **Paul Reese,** who is taking a leave of absence for study at Harvard University.

APPRECIATION

It is impossible to express the absolute sense of loss that his numerous friends throughout Chile felt when his untimely death in a plane crash became known.

Eulogio Sánchez Errázuriz graduated as a civil engineer at the Catholic University of Santiago in 1925 and though his early professional life was dedicated to that particular branch of engineering, in 1930 he became deeply interested in mining, an undertaking for which he was eminently suited by nature and in which he was to shine with great success and achievement.

From the start, he visualized the great possibilities of the Punitaqui vein as a low-grade gold deposit and developed it gradually, building up its milling capacity from profits and improving its metallurgy so as to gain the greatest possible returns from its gold, mercury and copper values through differential flotation, cyanidation and a plant to distill the mercury from the Cu-Hg concentrate. Compañía Minera Punitaqui was always a model of efficient mining and milling operations and the best camp in Chile to train young mining graduates. When Punitaqui's success was assured, he developed the tough Cerro Negro copper prospect in central Chile, building a 400-tpd mill and daring to go ahead to success in spite of the pessimism of others and a very difficult ore to mill. From central Chile, he went far south to Aisén to explore the almost inaccessible lead-zinc and copper deposits of Buenos Aires Lake, building in that distant and cold region a differential lead-zinc flotation mill, a hydroelectric power plant, ships to navigate the lake and two Scotch hearths to obtain maximum profits from the lead. As there are no roads to that district from the Chilean coast, much of the machinery and the fuel for the early diesels had to be flown in from Santiago.

With some of Punitaqui's capacity idle, he acquired numerous claims and mines in the old and famous Tamaya copper camp and started to build there a 400-tpd flotation mill to treat the 2% damps and fills of the once very rich bonanza. The Tamaya mill is scheduled to start operations in October next but the man whose courage and energy this new venture is due will not be present to see one of his numerous dreams come true.

He was one of the engineers who reported favorably on the necessity of building a steel mill in southern Chile and one of the directors and guiding lights of this $125-million enterprise from the very start; more than 20 years ago he helped to organize and develop the only Chilean petroleum products distributing company and was one of its directors from its inception. Until recently he was president of Sociedad Nacional de Comercio which he nursed carefully to robust health.

Scion of old and aristocratic Chilean families, he was modest, unassuming, generous and the best of friends. He had a quick and brilliant brain well tempered with sound judgment and an iron will. A great leader of men, he possessed that rare gift of picking the right ones for any kind of job and trusting them to carry out the work with just the needed amount of advice and encouragement.

Though he obtained fame and fortune as an entrepreneur, his greatest achievement in life was as a civic leader during a period of Chilean history when the country was in most serious danger from within. His noble attitude then and always proved him to be a great patriot and a man absolutely devoid of ambition and love of political power.

Fernando Benitez
Sali Hochschild S. A.
Santiago, Chile

OBITUARIES

Grant O. Anderson, 79, pioneer structural superintendent in the mining industry, died July 22 in San Fernando, Calif. Well known in many states for the building of mills, he is best remembered for the old Camp Bird Mill in Ouray, Colo., the original molybdenum mill at Climax, Colo. and the mill at Iron Mountain, Calif. His last job was with Southwestern Engineering of California.

Martin Butler Gentry, 69, internationally known mining engineer, died July 31 in Southern Pines, N. C., after an illness of several years. He began his career as a mining engineer with Col. William Braden in South America. He had been associated with Anaconda Co. of South America, and then with Freeport Sulphur Co., retiring as president of the latter concern six years ago.

T. C. Wiedenhoefer, 62, manager of the Mine Hoist Department, Nordberg Manufacturing Co., died July 24 at Butte, Mont. A graduate from the Michigan College of Mining & Technology, Mr. Wiedenhoefer was a member of the AIME for many years.

Sidney Norman, 85, former Spokane area mining editor and broker, died June 27 in Santa Rosa, Calif. He was active as a broker in the 1890s, and published "Mining Truth" and later, the "Northwest Mining News."

Earl L. Modesitt, 68, retired mining and oil executive, died July 19 in Denver, Colo. He pioneered in the recovery of potash from the brine lakes in Nebraska, and served as president of Texas Potash Co. and Union Potash & Chemical Co. from 1932 to 1941.

C. G. WILLARD, 69, recognized authority in the ore-grinding field, died July 30 in Denver following a prolonged illness. Joining Mill & Smelter Supply Co. in 1918 as assistant manager of the Marcy Mill division, he later became manager, a director of the company, executive vice president and director of Colorado Iron Works Co., and a vice president of General Iron Works Co. A graduate of South Dakota School of Mines, he was a member of AIME, American Mining Congress and was active in the Colorado Mining Association.

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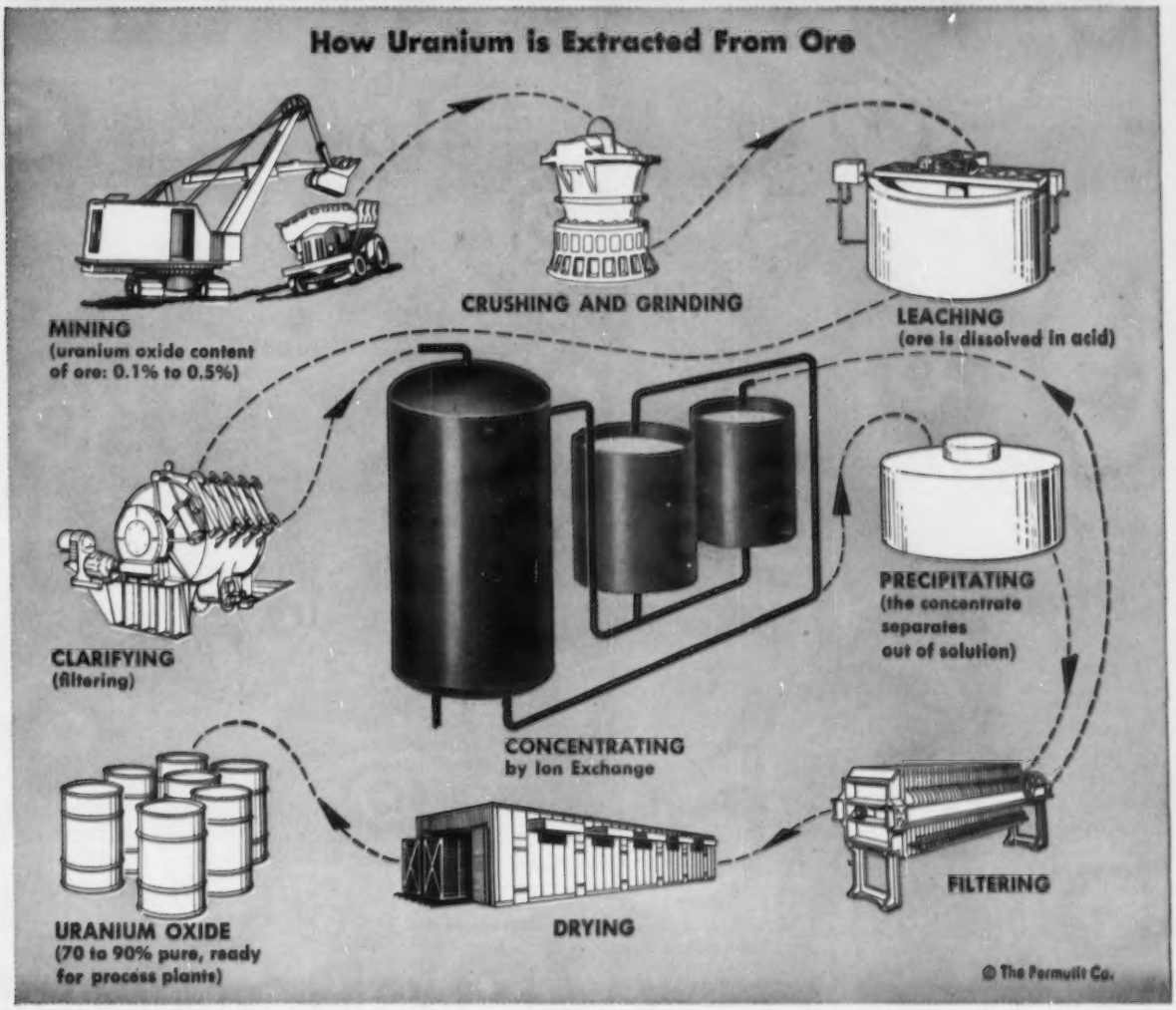

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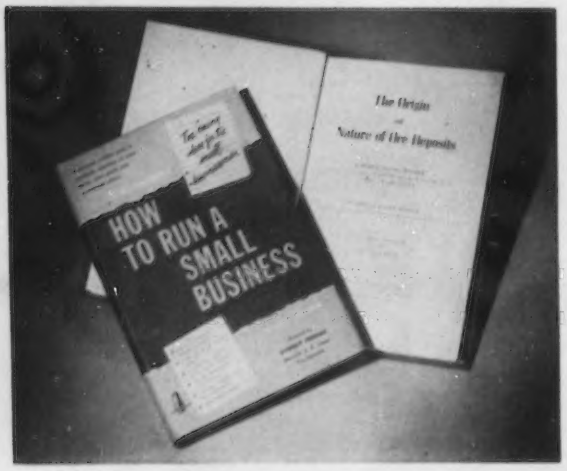
NEW BOOKS



The Origin and Nature of Ore Deposits, by Robert Tunstall Walker and Woodville Joseph Walker. An outstanding piece of work by two former working geologists covering the origin of: fissures; mantos; pipes; irregular masses; basic and silicic rock; copper, quartz, iron, uranium orebodies. The authors attempt to resolve the conflict between theory and fact, offer reasonable explanations of the origin of certain deposits.

Additional chapters cover indicator gangue minerals for sulphide deposits and exploration practice.

Published by Walker Associates, Box 1068, Colorado Springs. Colo. A good job well done. Illustrated in 368 pp. Price $6.50.

How to Run a Small Business, by J. K. Lasser as revised by Sydney Prerau. Time-saving and money-making hints for the small business owner. Many parts apply to the small mine owner and the future mine manager. Published by McGraw-Hill Book Co., 330 West 42nd St., New York 36, N. Y. 325 pp. Price $4.95.

Atoms and Energy, by H. S. W. Massey. Non-technical account of the developments in nuclear energy. Starts with the make-up of the atom and ends with discussion of present day research. Published by Philosophical Library Inc., 15 East 40th St., New York 16, N. Y. 168 pp. Price $4.75.

Principles of Chemical Engineering Thermodynamics, by Ernest D. Wilson and Harold C. Ries. Principles, problems and practical applications of the laws of thermodynamics. Published by McGraw-Hill Book Co., 330 West 42nd St., New York 36, N. Y. 368 pp. Price $7.50.

Nuclear Fuels, by David H. Gurinsky and George J. Dienes. Organizes into three sections, metallurgy of thorium and uranium, radiation effects and solid fuel. Based on material released at Geneva. Published by D. Van Nostrand Co., Inc., Princeton, New Jersey. 336 pp. Price $7.50.

Handbuch der Sonderstahlkunde, von Eduard Houdremont. Dritte, verbesserte Auflage. Zu beziehen durch Lange & Springer, Berlin W 35. Reichpietschufer 20. Mit 1297 Abbildungen und 294 Zahlentafeln. 1538 Seiten. In zwei Banden. Ganzleinen DM 220.

Chromium, Vol I, Chemistry of Chromium and its Compounds, edited by Marvin J. Udy. Covers sources, chemical and physical properties, biological effects, production of compounds and uses. ACS Monograph Series No. 132. Published by Reinhold Publishing Corp., 430 Park Ave., New York 22, N. Y. 422 pp. Price $11.

Safety Management, Accident Cost and Control, by R. H. Simonds and J. V. Grimaldi. Published by Richard D. Irwin, Inc., Homewood, Ill. 539 pp. Price $7.80.

Evolution of Igneous Rocks, by N. L. Bowen. Published by Dover Publications Inc., 920 Broadway, New York 10, N. Y. 322 pp. Paper backed at $1.85; in cloth at $3.75.

Elementary Crystallography, by M. J. Buerger. An introduction to the study of crystals. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. Illustrated in 524 pp. Price $8.75.

Designed for Digging, by H. F. Williamson and K. H. Myers, II. Public relations book covering the first 75 years of Bucyrus-Erie Co. Published by Northwestern University Press, Evanston, Ill. 372 pp. Price $7.50.

Supervisors Safety Manual, by National Safety Council, 425 North Michigan Ave., Chicago 11, Ill. Illustrated in 354 pp. Members price—$3.25. Otherwise—$6.50.

Geological Case Histories, Vol. II—1956, edited by Paul L. Lyons. Contains 53 papers on reefs, stratiographic traps, mining (Pima property) and new uses. Published by Society of Exploration Geophysicists, Box 1536, Tulsa 1, Okla. 661 pp. Price $6.

Physics and Mathematics, series one, progress in nuclear energy, by R. A. Charpie, J. Horowitz, D. J. Hughes and D. J. Littler. This book is a summary of results and methods of analysis of the properties of fissionable nuclei. Published by McGraw-Hill Book Co., 330 W. 42nd St., New York 36, N. Y. 392 pp. Price $12.

Mining Year Book—1956, by Walter E. Skinner. Seventieth annual issue. Gives up-to-date information on 951 mining companies in all parts of the world. Describes properties held, names officials and lists dividends and financial matters. Book also has mining engineers and managers name section, and buyers' guide. Published by Walter E. Skinner, 20 Copthall Ave., London, E. C. 2. Price $7, post free abroad.

Sodium, its Manufacture, Properties and Uses, by Marshall Sittig. Covers all the ramifications of sodium from sources to uses and analysis. ACS Monograph Series No. 133. Published by Reinhold Publishing Corp., 430 Park Ave., New York 22, N. Y. 504 pp. Price $12.50.

Lehrbuch der Bergwerksmacchinen (Kraft und Arbeitsmaschinen), von C. Hoffmann Fünfte, erweiterte und verbesserte Auflage. Zu beziehen durch Springer-Verlag, Berlin W 35, Reichpietschufer 20. Ladenpreis: Ganzleinen DM 36.

Canadian Trade Index—1956, by Canadian Manufacturers' Association, Inc., 67 Yonge St., Toronto 1, Ontario. A complete reference for buying and selling in Canada. 1,170 pp. Price $10.

British Non-ferrous Metals Directory. Third edition with up-to-date information on sources of supply, raw materials and semi-finished goods from British firms. Published by Quin Press Ltd., Birkett House, 27, Albemarle St., London, W. 1. 317 pp. Price £1/10, post free.

Reports and Bulletins

Gold Mining in Ontario, an Economic Study 1955. Report of the Committee of Inquiry into the Economics of the Gold Mining Industry, 1955. Published by Baptist Johnston, Printer to the Queen's Most Excellent Majesty, Toronto, Canada. Photos, tables and data in 117 pp.

Geomagnetic Survey of the Tioga Area, North Dakota, by Miller Hansen. North Dakota Geological Survey, Grand Forks. Map on one page.

Bulletin 165, Geology and Mineral Deposits of Barstow Quadrangle, San Bernardino County, California, by Oliver E. Bowen Jr. and Joseph A. Pask. State of California Department of Natural Resources, Ferry Building, San Francisco. Maps, photos in 99 pp. Price $3 (cloth).

Geological Survey No. 7, Geology of Portland Creek Port Saunders Area, West Coast, by S. J. Nelson. Province of Newfoundland Department of Mines and Resources, Mines Branch, St. John's. 57 pp.

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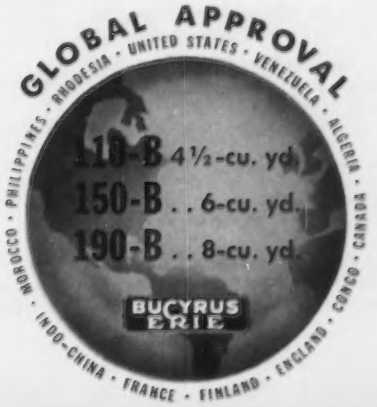
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• Gmelins Handbuch der Anorganischen Chemie. Zu beziehen durch Verlag Chemie gmbh, Weinheim/Bergstr; oder 1074 Washington Ave., Pelham Manor, N. Y.

Kupfer, Teil A, Lieferung 1. Geschichtliches. Vorkommen Aufbereitung. Metallurgie Pulvermetallurgie Technische Darstellung der Kupferverbindungen. 710 Seiten. Kart. DM 387 ($92.13).

Kupfer, Teil A, Lieferung 2. Bildung und Darstellung. Physikalische Eigenschaften. Electrochemisches Verhalten. Chemisches Verhalten. Physiologische Schadigung. Nachweis und Bestimmung. 755 Seiten. Kart. DM 421 ($101.98).

Thorium und isotope. 406 Seiten. Kart. DM 227 ($55.22)—Ganz. DM 232.

Calcium, Teil B, Lieferung 1. 264 Seiten. Kart. DM 147 ($34.99).

• Application for the following free literature should be made to the address below. Because of the limited editions, only one copy of any particular edition can be sent to any one person and only a modest number of a variety of publications can be furnished to an applicant. Please order only those publications actually needed. Publications Distribution Section, U. S. Bureau of Mines, 4800 Forbes St., Pittsburgh 13, Pa.

Report of Investigation 5155, Design of Bolting System to Reinforce Bedded Mine Roof, by Louis A. Panek. 16 pp.

Report of Investigation 5192, Quien Sabe Antimony Mine, San Benito County, California, by Frank J. Wiebelt. 29 pp.

Report of Investigation 5194, Anchorage Testing of Mine-Roof Bolts, by A. J. Barry, L. A. Panek and John A. McCormick. 19 pp.

Report of Investigation 5195, Studies of the Snettisham Magnetite Deposit Southeastern Alaska, by R. L. Thorne and R. R. Wells. 41 pp.

Report of Investigation 5204, The Brown Derby Pegmatites, Gunnison County, Colorado, by R. R. McLellan. 21 pp.

Report of Investigation 5205, Electrolytic Recovery of Zinc From Galvanizing Sal Skimmings, by R. M. Sullivan. 21 pp.

Report of Investigation 5213, Effect of Temperature on Electrostatic Separation of Minerals, by Foster Fraas. 15 pp.

Report of Investigation 5214, Zirconium Purification Using Basic Sulphate Precipitation, by R. H. Nielsen and R. L. Govro. 14 pp.

Report of Investigation 5219, Design and Development of a Pneumatic Vibrating-Blade Planer for Mining Phosphate Rock, by T. E. Howard. 30 pp.

Report of Investigation 5240, Brecciated Manganese Deposits in Johnson County, Tennessee, by R. C. Hickman. 14 pp.

Information Circular 7735, Methods and Operations at Kaiser Steel Corp. Eagle Mountain Iron Mine, Riverside County, California, by R. R. Trengove. Illustrated in 25 pp.

Information Circular 7738, Limestone and Dolomite, by Oliver Bowles. Commodity study and productive methods. 28 pp.

Information Circular 7740, Reconnaissance of the Red Bed Copper Deposits in Southeastern Colorado and New Mexico, by John H. Soule. Maps and 74 pp.

Information Circular 7743, Mining Methods and Costs at the Morning Mine, American Smelting & Refining Co., Shoshone County, Idaho, by John R. Reynolds. 40 pp.

Information Circular 7744, Analysis of 346 Accidents Underground Iron-Ore Mine, Lake Superior District, by R. O. Pynnonen, R. G. Stott, J. B. Stepan and J. A. Johnson. 15 pp.

Information Circular 7745, Chrysotile-Asbestos Deposits of Arizona, by L. A. Stewart. 41 pp.

All correspondence for back issues of *E&MJ*, not current, should be addressed to . . . Back Issue Corp., 16 E. 46th St., New York 17, N. Y. or to the warehouse at 805 Mamaroneck Ave., Mamaroneck, N. Y.

Reports and Bulletins

Classification of Rocks, by Russell B. Travis. Third printing of this best seller among rock hounds and geologists. Published by the Department of Publications, Colorado School of Mines, Golden. Illustrated. Price $1.

Mineral Resources of Rajasthan, Bulletin No. 4, by M. L. Sethi. Published by the Government of Rajasthan, Department of Mines, Udaipur. Map and 168 pp. Price Rs 5/8.

Mineral Resources—Navajo-Hopi Indian Reservation, Arizona-Utah, Vol. 1, **Metalliferous Minerals and Mineral Fuel,** by George A. Kiersch. University of Arizona, Tucson. Maps, tables and text in 75 pp.

Canadian Mineral Industry—1953. Complete data on mining activities in Canada during 1953. Published by Dept. of Mines and Technical Surveys, Ottawa. 232 pp. Price $1.

Report of Investigation No. 6, Geology of the Peake and Denison Region, by Millard L. Reyner, with a gravity survey by W. H. Knopman. Geological Survey, Dept. of Mines, Adelaide, South Australia. Maps and 23 pp.

Iron and Steel Industry in Europe. Published by Organisation of European Economic Cooperation, 2000 P Street, N. W., Washington 6, D. C. 120 pp. Price $1.50.

Iron Ore Deposits of Nevada, Part A, Geology of Buena Vista Hills, Churchill and Pershing Counties, Nevada, by R. G. Reeves and V. E. Kral. Bulletin No. 33. Published by University of Nevada, Reno. Map and 32 pp. Price $1.

Concentration des minerais de wolfram et de niobium-tantale au Congo belge et au Ruanda-Urundi, par A. Prigogine. Academie royale des Sciences coloniales Memoir No. 8. Avenue Marnix 25, Bruxelles. 184 pp. Prix F240.

Mineral Resources of Navajo-Hopi Reservation, Arizona-Utah, Vol. II, Nonmetallic Minerals. Published by University of Arizona, Tucson. 30 pp.

Bulletin No. 26, Geology and Ecology of Nachingwea Region, by D. R. Grantham and R. D. Pilson. Dar Es Salaam, Tanganyika. Maps and 31 pp. Price 7/50.

Lead Deposits in the Upper Cambrian of Central Texas, by V. B. Barnes. Report of Investigation No. 26, Bureau of Economic Geology, University of Texas, Austin 12. 64 pp.

Metallurgical Works in Canada, Part I-Primary Iron and Steel. By Mineral Resources Division, Mines Branch, Dept. of Mines and Technical Surveys, Ottawa. Lists plants, capacities and equipment installed. 28 pp. Price 25c.

Memoir No. 281, Stratiography and Palaeontology of the Interlake Group and Stonewall Formation, Southern Manitoba, by Colin W. Stearn. Geological Survey of Canada, Dept. of Mines and Technical Surveys, Ottawa. Illustrations and map in 159 pp. Price $1.

Bulletin No. 34, Geology of the South Manzano Mountains, New Mexico, by J. T. Stark. State Bureau of Mines and Mineral Resources, New Mexico Institute of Mining and Technology, Socorro. Map and 46 pp.

Bulletin No 8, Geology of the Lyndonville Area, Vermont, by J. G. Dennis. Vermont Geological Survey. Vermont Development Commission, Montpelier.

Motion Pictures

Diamond Production in South Africa, How Bits and Barrels Are Made and **Industrial Application of Diamond Products.** These three 25 minute sound and color films are available from Christensen Diamond Products Co., P. O. Box 387, Salt Lake City 10, Utah. Any one or all three may be obtained.

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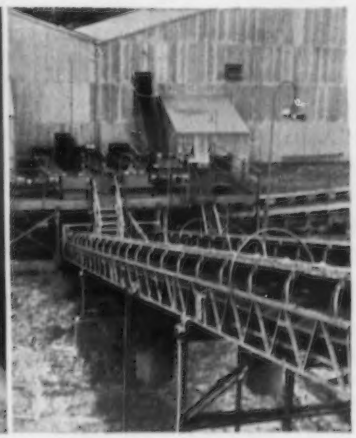

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Visit our exhibit . . . American Mining Congress 1956 Mining Show . . . Los Angeles, October 1-4

THIS MONTH IN MINING (*Continued from p 73*)

Michigan Tech Builds a Mineral Study Lab

"TO SUPPLY INCREASING TONNAGE of merchantable ore to the iron and steel industries" is one of the most pressing problems facing Michigan's mineral industries according to M. E. Volin, director of mineral research, Michigan College of Mining and Technology. Mr. Volin made the statement at the dedication of Michigan Tech's latest effort to solve that problem, the new Ores Research Building, opened on the Houghton campus Aug. 8.

Grover J. Holt, general manager of Cleveland-Cliff's Michigan and Minnesota mining operations, received an honorary degree of Doctor of Engineering at the dedication ceremonies and called research a combination of curiosity, planning, toil, sweat and tears." Dr. Grover C. Dillman, president of Tech, awarded the degree.

Built and equipped at a cost of $750,000, the new building has a laboratory-office section 132x55 ft with 17 laboratories and a machine shop. Pilot plant is 82x50 ft and encloses 140,000 cu ft of working space. Plant is equipped with a truck entrance, a 5-ton overhead crane, a 5,000-lb floor scale, Rotoclone air scrubber-exhausters, unit heaters and ten steel bins for sample storage as well as other facilities.

AEC Revokes Withdrawal

APPROXIMATELY 1960 ACRES of once withdrawn public land in the Salt Lake meridian, Monticello district, San Juan County, Utah, have been released from withdrawal by AEC application to Bureau of Land Management.

Release of this land does not imply that it is open to claim staking. AEC suggests checking with Land Office, BML, Salt Lake City, before making any attempt to file claim to any of the lands. It might have unpatented claims or might be covered by some previous and still effective land withdrawal.

Republic Spends $8-million

TITANIUM AND TITANIUM alloy product capacity at Republic Steel Corp.'s Canton and Masillon, Ohio facilities will be increased to about 12-million lb per year following a $8-million expansion program.

Entire expansion, from present 3-million lb capacity, will be completed by late 1957 according to C. M. White, president. It is covered in large part by a certificate of necessity from ODM which permits rapid depreciation of taxes. Major new facilities include twelve vacuum double-melt furnaces for titanium ingot production.

Sicily Slims Stockpile To Solve a Sulphur Surplus

RECENT STEPS TAKEN by the Italian and regional Sicilian governments, following those taken earlier, seem to be relieving the distress experienced by Italian sulphur producers over the past few decades. Loans and subsidies have been authorized by the two governments to help modernize the mines and allow Italy to compete on the world market until the modernization has been completed.

At this time, the Sicilian government has given early approval to a bill that will spend some $20-million for mine modernization and to help producers cut down the high bank-interest rates burdening the producers. Once the mines have been modernized it is felt that they can produce at $42 to $48 a ton.

In 1955, raw sulphur stocks were at an all time high: 330,000 tons. The Italian Government ordered all producers to sell to Ente Zolfi Sulphur Corp. at a declining price currently at $70 a ton, as against export price of $48. At the same time Ente Zolfi paid exporters from $17 to $33 a ton to keep the export price down. Two other steps were taken. Italy pays Italian producers 11,000 lire a ton for sulphur stocks, up to a 300,000-ton stockpile limit. Also, $1.8-million has been set aside for distribution to miners on basis of their production costs.

Second step covers only Sicilian producers. Enacted by the regional government it will pay a grant of 8- to 10-thousand lire a ton for newly mined sulphur.

Argentine Tramway Ups Sulphur Production

INCREASE OF PRODUCTION at the Volcan Overo sulphur mine at San Rafael, Mendoza, Argentina, was accomplished in early 1956 by Sociedad Minera de Argentina with construction of an 11,622-meter aerial tramway. Tramway is bicable gravity-type, with 73 towers, two curved supports, a loading station, angle station and unloading station (above).

Upper section, 6,401m long, connects the loading section (altitude 4,456m) with the angle station and powered by a 75 hp engine. Hydraulic governor maintains a speed of 3.15m per second whether under power or gravity. Lower section runs to unloading section at elevation 2,491m and is operated in a similar manner. All towers are of steel.

Buckets are 151m apart, with 165 buckets in line. Tramway capacity is 30 metric tph, with bin capacity at the loading station of 300 tons.

Sominar produces more than 8,000 of the total national production of 22,000 metric tons per year. Argentine Military Factories in the Andean region of the province of Salta accounts for the rest of production.

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WATER For long wear and outstanding value, this easy-to-handle hose has what you need. Reinforced with multiple plies of high tensile yarn, it takes higher than usual working pressures. Cover stands up to weather extremes without cracking or peeling.

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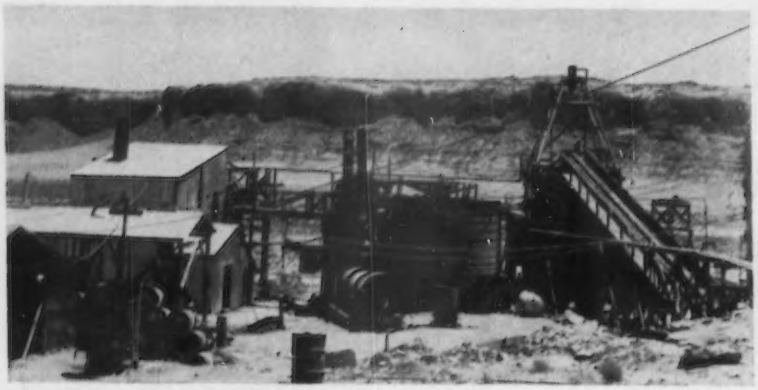
THIS MONTH IN MINING *(Continued)*



VCA's Concentrator Pays Off an Investment

VANADIUM CORP. of America's concentrating plant works ore at Monument No. 2 mine in northwestern Arizona, on Navajo reservation. VCA vice president D. W. (Denny) Viles says concentrator has been expanded to 300-tpd capacity, and has virtually paid for itself in time it has been in operation—slightly over a year. Concentrator processes ore of less than 0.10% uranium content, brings it up to 0.25% or so before it is trucked to mill at Durango, Colo., 175 miles away. Concentrator cost about $250,000, and presently is only up-grading plant operating on Colorado Plateau. However, Union Carbide Nuclear plans to build two of its own—near Slick Rock, Colo., and Green River, Utah—using different process. Others are reported looking into up-grading possibilities.

European Mining Companies Issue Reports

THREE OF EUROPE'S major mining and metallurgical operators have released annual reports for the year 1955.

Montecatini, Societa Generale per L'Industria Mineraria e Chemica Anonima, reported a net profit of 10,178,846,649 Lira in 1955 from its many diversified holdings in the mining, metallurgical, petroleum, coal-chemical, inorganic-organic chemical and electrical industries.

In the mining and metallurgical fields the company produced the following tonnages in 1955, as compared with all-Italy production in parentheses:

Pyrite	1,147,361 (1,290,000)
Sulphur	32,151 (185,000)
Bauxite	260,784 (326,000)
Superphosphate	1,380,000
Copper sulphate	55,778
Aluminum	32,500 (61,700)

Union Miniere du Haut-Katanga handled 8.9-million tons of ore and over 10-million tons waste. They reported the following production:

Kolwezi—504,421 tons of 26.98% Cu concentrate; 32,863 tons, 10% Cu; and 7.9% Co.

Kipushi—62,321 tons, 22.7% Cu; 233,254 tons, 29% Cu; and 114,167 tons, 59.6% Zn concentrate.

Ruwe—117,023 tons, 25.54% Cu; 119-691 tons, 7.5% Cu.

Kamoto—4,972 tons, 6.46% Co; and 49,891 tons intermediate material.

Ruashi—10,853 tons, 12.5% Cu.

Total copper produced at Lubumbashi, Shituru and Panda amounted to 234,673 tons. In addition, the following were produced: Cobalt—8,567 tons (world production was 12,300); Cadmium—53,395 kilos; Silver—126,972 kilos; Gold—16 kilos; and Lead—57 tons.

The Kolwezi concentrator was expanded to 270,000 tpm. Miniere had a net income during the year of Congolese francs—4,206,311,767.

Vieille Montagne had a net income in 1955 of francs—130,011,719, according to their annual report. They showed the following production:

Zinc—147,338 tons; zinc sheet—37,320 tons; white zinc—16,137 tons; soft lead—31,096 tons; silver—37,865 kg; cadmium—577 tons; sulphuric acid—283,437 tons; and copper sulphate—2,471 tons.

Republic Plans Lab

REPUBLIC STEEL CORP. is planning construction of a $3-million metallurgical research laboratory at Independence, Ohio. The facility will be devoted to basic metallurgy research and will serve Republic's holdings in the Cleveland and northern Ohio region. Completion of the two-building installation is expected in early 1957.

Henderson Ti Increases

TITANIUM SPONGE PRODUCTION at Titanium Metals Corporation of America, Henderson, Nev. will be increased 50% and "related melting facilities" for ingot production 80%, according to an announcement by National Lead Co. and Allegheny Ludlum Steel Corp., parent companies of the firm. When both programs are completed late next year, the firms say, total capacity of the Nevada unit will be 25 tpd sponge and 30 tpd ingots.

Mining Calendar

American Chemical Society, 130th national meeting. Atlantic City, N. J., Sept. 16-21

Rocky Mountain Minerals Conference, third annual session, AIME, Salt Lake City, Utah., Sept. 26-28

Management, Economics and Technology for Atomic Industry Conference. Morrison Hotel, Chicago, Sept. 25-27

German Society of Metallurgy and Mining, general assembly. Klagenfurt, Austria, Sept. 26-29

American Congress on Surveying and Mapping and American Society of Photogrammetry. Denver, Sept. 30

National Electronics Conference, Hotel Sherman Chicago, Ill., Oct. 1-3

American Mining Congress Mining Show, Shrine Exposition Hall. Los Angeles, Calif., Oct. 1-5

Fifth National Clay Conference, University of Illinois. Urbana, Ill., Oct. 8-10

National Metal Exposition and Congress, sponsored by American Society for Metals, Cleveland, Ohio, Oct. 8-12

Sixth annual Drilling Symposium, University of Minnesota. Minneapolis, Oct. 11-13

28th annual meeting, Society of Exploration Geophysicists, San Antonio, Tex. Oct. 13-16

44th National Safety Congress. Chicago, Ill., Oct. 22-26

AIME-ASME Joint Solid Fuels Conference, Sheraton Park Hotel, Washington, D. C. Oct. 25-26

New Mexico Mining Assn. and International Mining Assn. Carlsbad, N. M., Nov. 1-3

Northeastern Branch conference, AIME. Hershey, Pa., Nov. 8-10

American Society for Metals, second world metallurgical conference. Cleveland, Ohio, November

Mining-Chemical Inter-Industry Conference, sponsored by San Francisco Chamber of Commerce. Fairmont Hotel, Nov. 9

National Western Mining Conference, sponsored by Colorado Mining Assn. Denver, Feb. 7-9, 1957

Annual meeting, AIME, Hotels Roosevelt and Jung, New Orleans, La. Feb. 24-28, 1957

Alabama Magnesium Plant Will Raise U. S. Output

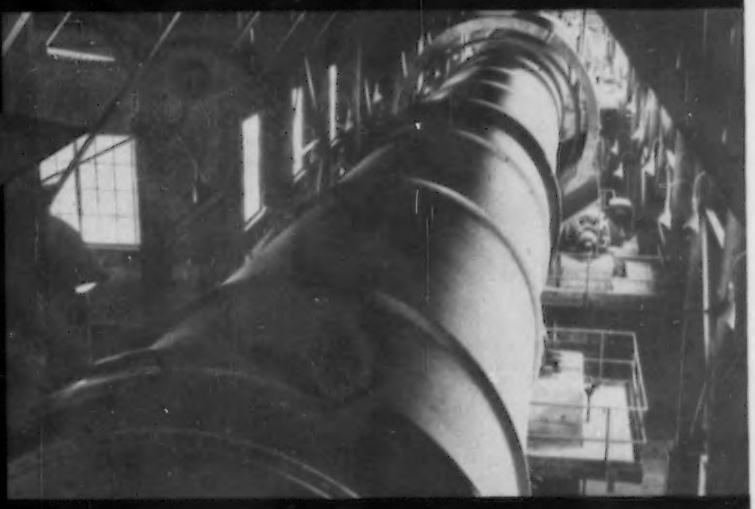
PLANS TO BUILD a $7-million magnesium plant at Selma, Ala., that would up the nation's commercial output by 15%, were announced recently by E. Howard Perkins, president and chairman of Brooks

(Continued on p 142)

SMIDTH

Rotary Kilns

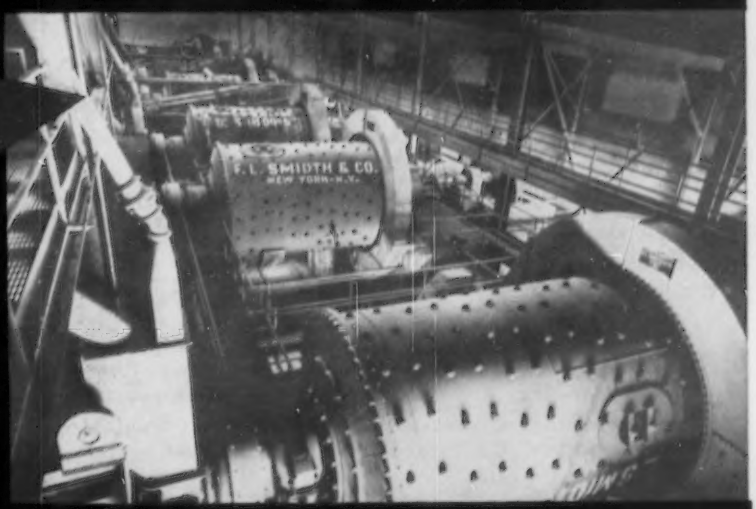
For sintering, nodulizing, calcining, desulphurizing; oxidizing and reducing roasting—coolers, precoolers, preheaters, recuperators—and auxiliary equipment.



Grinding Mills

Ball mills, tube mills and multicompartment mills—open or closed circuit—wet or dry grinding also airswept for grinding and drying.

Over 1,000 Smidth Rotary Kilns and over 5,000 Grinding Mills supplied all over the world.



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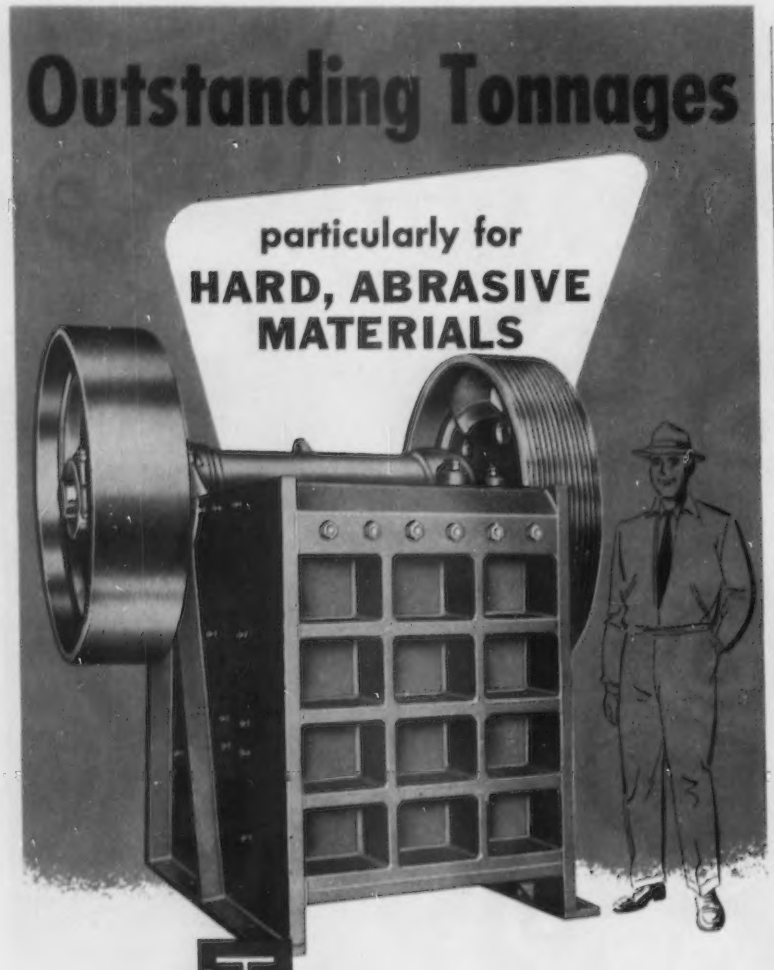


NEW McLANAHAN JAWMASTER CRUSHERS

With force-feed action and long jaw design, these high-capacity, all steel Jawmasters feature roller bearings throughout. There are thirteen models—ranging from 10 x 16 to 40 x 48, with capacities up to 750 tons per hour.

Write for Bulletin JM-56.

McLANAHAN AND STONE CORPORATION
255 Wall Street, Hollidaysburg, Pa.
McLANAHAN
Manufacturers — Founders — Machinists
Sales Offices in Principal Cities of the United States
Pit, Mine and Quarry Equipment Headquarters Since 1835

Magnesium *(Continued)*

and Perkins Inc., a Detroit magnesium fabricator.

Operation of the plant will be handled by Alabama Metallurgical Corp., owned jointly by Brooks and Perkins and Dominion Magnesium Ltd. of Canada.

Perkins

Options have been taken on 480 acres on the Alabama River, 50 miles west of Montgomery. The plant, scheduled for operation in 1957, will have a payroll of $1-million and an annual capacity of 10,000 tons. At present, the only commercial producer of magnesium in the U. S. is Dow Chemical Corp.

Dolomite rock will be used as the plant's raw material. The Alabama rock was tested in Canada and found to be ideal. Mild climate, available labor and the possibility that the Alabama River will be made navigable to that point were other factors influencing the location.

Calcium metal, used in the reduction of thorium, and other related chemical and metallurgical products will be produced at Selma, it was announced.

IN THE U. S.

ALASKA

Forty men of the Alaskan Geological Survey have taken to Alaskan roads for a summer mineral mapping and geological investigation program. During the season, parties will be scattered throughout the territory on the first Alaskan work under the new national mineral policy.

Placer deposits in Eureka districts and other spots in the interior will be investigated by a team working between Tofty and Manley Hot Springs. They were scheduled to move north in mid-August.

Railbelt coal exploration will be conducted at Healy and a report of high-grade bituminous coal in Knob Creek district near Palmer will be investigated. Work will also cover Chitna Valley, Kodiak, Kendrik Bay, Bokan Mountains, Big Delta and along the Yukon River.

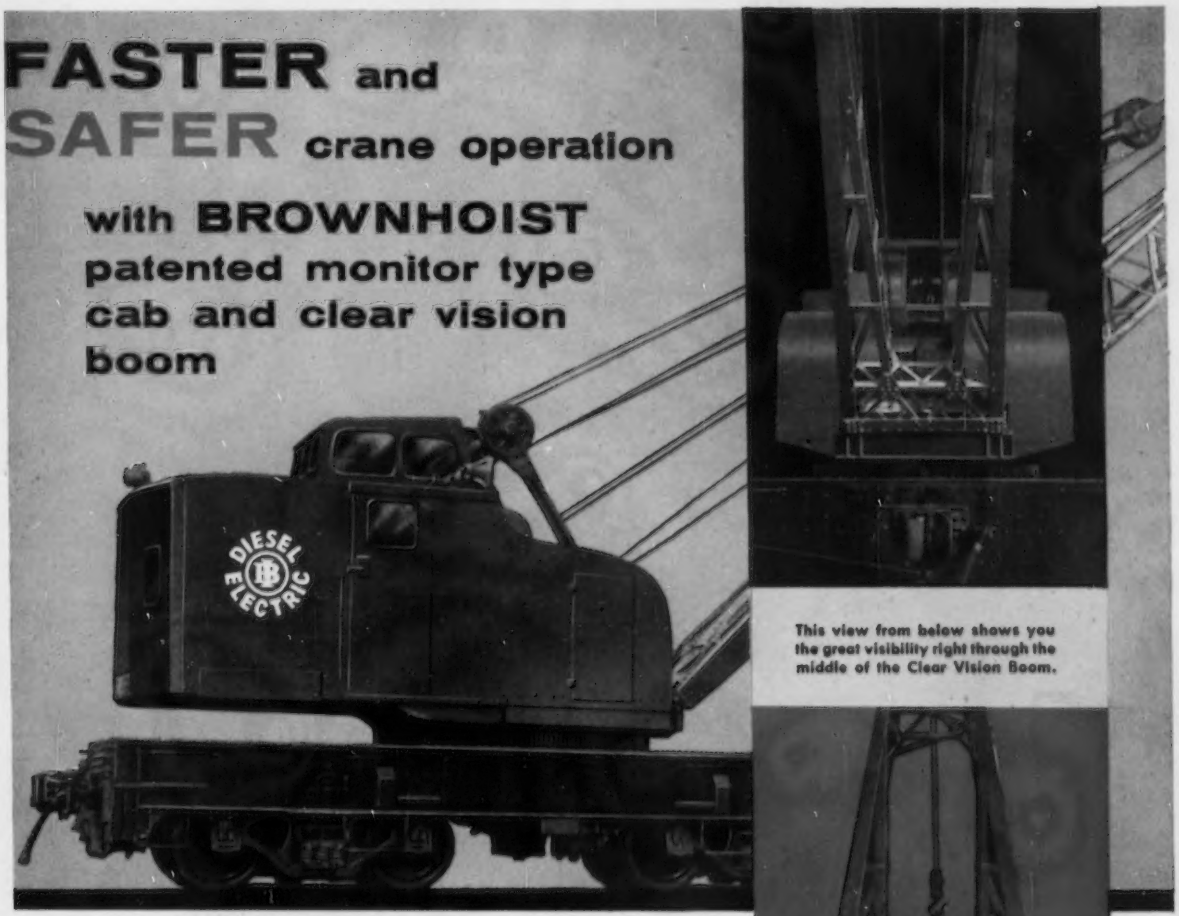
ARIZONA

Arizona has moved to condemn land owned by Phelps Dodge Corp. so it can be used as a highway site without fear of it later being torn up by mining development.

This is the first time the state has filed suit to condemn surface rights on a mining claim of any major company.

Land involved is a half mile new section of U.S. 80 in the Cochise County

FASTER and SAFER crane operation with BROWNHOIST patented monitor type cab and clear vision boom

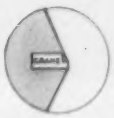


This view from below shows you the great visibility right through the middle of the Clear Vision Boom.

Windows on all sides of the raised Monitor Type Cab of a Brownhoist Locomotive Crane give the operator a full view of the area in which he is working, and the open type Clear Vision Boom lets him look right down at the work itself. This complete 360° visibility—to the sides, to the rear, and forward into the car—allows the operator to work more rapidly, without unnecessary crane swinging, and also increases safety by eliminating blind spots. The patented Monitor Type Cab has a door on each side, and all doors and windows can be opened for ventilation. A soundproof partition separates the operator from the engine and controls are placed within convenient reach of his adjustable seat. These factors assure ease of operation of the Brownhoist Locomotive Crane, and Brownhoist engineering assures maximum performance. Anti-friction bearings are used throughout including machinery side frames. The boom hoist is worm driven for smooth, safe operation. Dynamatic clutches disconnect all upperworks when travelling . . . give sure, positive control. High strength alloy steels bulwark the machine for heavy service. Throughout, Brownhoist Locomotive Cranes are designed and built for high capacity production. For further information write today for Catalog No. 548.

Approximate visibility from ordinary cab.

Approximate visibility from side-operated cab.



360° visibility from I. B. patented Monitor Type Cab.

Your operator can see exactly what he's working with in the car in front of him. Greater safety is the result.

188

BROWNHOIST MATERIALS HANDLING EQUIPMENT GIVES A LIFT TO AMERICAN INDUSTRY

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INSPECTION WITHOUT REJECTION. Under this close scrutiny, USS Lorain Rolled Plate Lining passes every test—shows it is ready to take the toughest kind of punishment.

SEE The United States Steel Hour. It's a full-hour TV program presented every other week by United States Steel. Consult your local newspaper for time and station.

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USS LORAIN ROLLED PLATE LININGS *and* USS GRINDING BALLS

USS

6-2286

UNITED STATES

For its enlarged plant . . .

Lone Star Cement

<u>again</u> chooses

USS Lorain Rolled Plate Lining

Lone Star Cement Corporation is one of the world's largest Portland cement producers. Now, at Nazareth, Pennsylvania, enlarged facilities are rapidly nearing completion which will bring their plant up to an annual capacity of 3,600,000 bbls.

For this huge new addition, Lone Star chose USS Lorain Rolled Plate Linings for their new grinding units. This selection was based on past performance in Lone Star's other plants. It's a tribute to the wearing qualities and design of these extra-tough linings.

This extra toughness stems from the use of high-carbon rolled steel in the liner plates and alloy rolled steel in the lift bars. Each lining is custom made to fit the exact requirements of a particular mill.

The heat-treated lift bars have a marked hardness differential from the liner plates; this retains lift for the life of the lining. The result is constant grinding efficiency, maintenance of output and, above all, reduced grinding costs.

The lining design selected by Lone Star for their new Nazareth mills was the USS Lorain "staggered" type of lining, which will greatly reduce impact and vibration in any grinding mill.

Like Lone Star, specify USS Lorain Rolled Steel Plate Lining if you are interested in the above improvements. You'll "stay" with it, too. For expert engineering assistance on any grinding problem, just write to Specialty Products Sales, United States Steel, 525 William Penn Place, Pittsburgh 30, Pa.

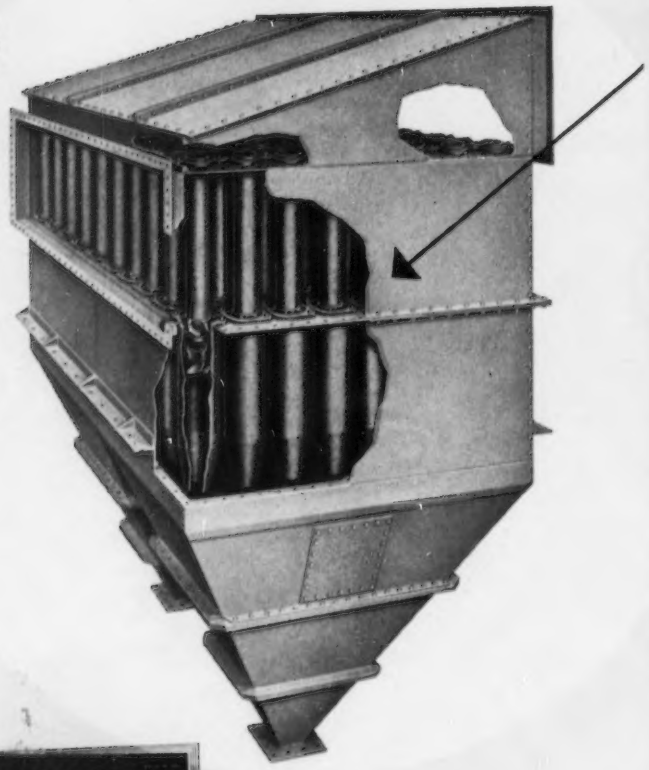
SHOWN DURING CONSTRUCTION are seven of the eight new ball mills that will bring Lone Star's annual capacity at Nazareth, Pa. to 3,600,000 bbls.

S T E E L

NEW

Cyclo-trell

Multiple Tube Dust Collector



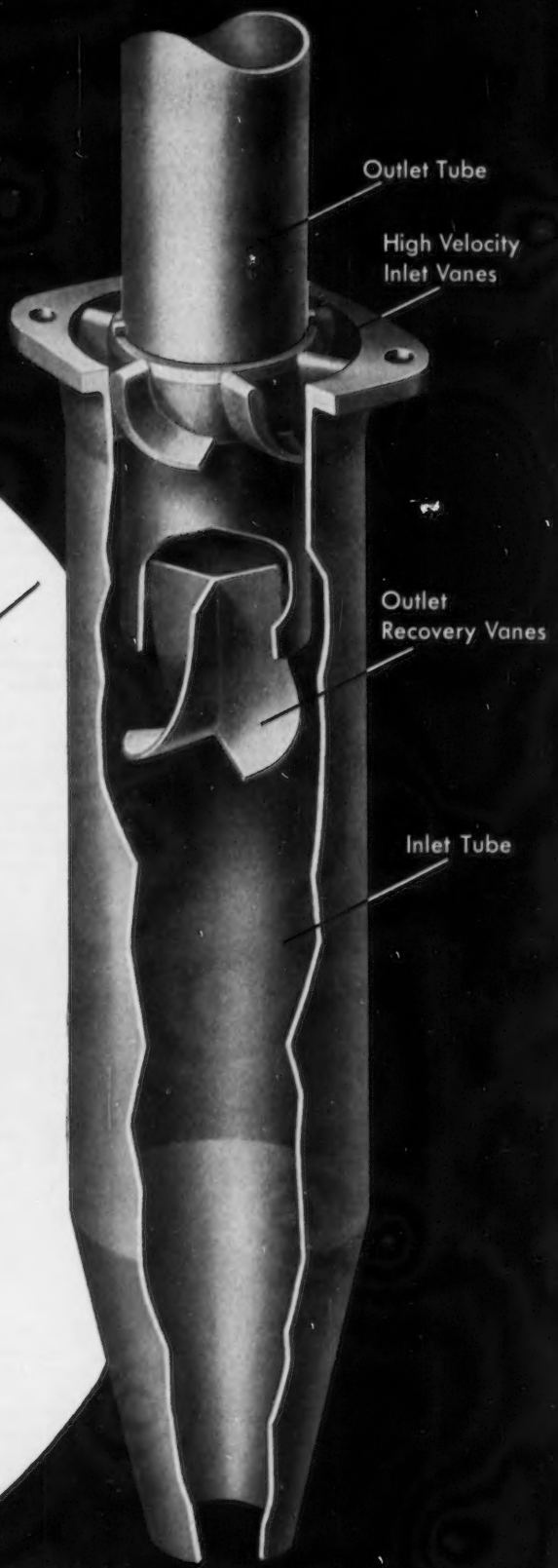
Here are a few brief facts on Research's new multiple tube mechanical collector.

- Collection efficiencies are higher, for a given pressure drop, than other conventional multiple tube collectors.
- Gas flow per tube is higher than conventional units. This means fewer tubes per collector and lower total cost for a given capacity.
- Cyclo-trell's design is based on Research's 45 years experience in manufacturing gas cleaning equipment. As the largest manufacturer of electrical precipitators in the world, Research-Cottrell has engineered and built many combination units consisting of precipitators and mechanical collectors.
- Bulletin M gives complete details on design features, efficiency, capacity and detailed dimensional drawings. Write for your copy today.

Arizona (*Continued*)

tons of upgraded ore, expected to assay

and Ella Owen, Henry E. and Vera



Higher Collection Efficiency

An important reason for Cyclo-trell's higher collection efficiency is the aerodynamically shaped inlet vane unit. The purpose of these vanes is to produce a fast spiral of incoming gas. The faster these gases spin, the greater the centrifugal force on the suspended dust.

After testing many types and curvatures of vanes, Research found that this new design resulted in less turbulence, greater centrifugal force and higher collection efficiencies.

Greater Gas Handling Capacity

To develop a higher gas flow capacity than other multiple tube collectors, Research's engineers developed the following design features. First, by using a 10″ diameter inlet tube, instead of the conventional 9″ tube, the flow of incoming gas was increased.

The next step was to straighten the gas flow as it entered the outlet tube, since a spiraling gas stream creates more resistance than a straight through flow. In the Cyclo-trell this spiral is eliminated, and energy is recovered in the outlet tube by the Outlet Recovery Vanes. By positioning these vanes below the tube, rather than inside the tube, resistance has been further reduced.

This combination of features means greater gas flow per tube, fewer tubes per collector and a lower total cost for a given capacity and efficiency.

Research-Cottrell, Inc.

Main Office and Plant: Bound Brook, New Jersey • 405 Lexington Ave., New York 17, N. Y.
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Arizona (*Continued*)

town of Lowell. Before permitting the state to build the road over its land, the company wanted assurance of surface rights in the future.

The state feared the company might dig up the road anytime it considered ore production in the area feasible.

CALIFORNIA

Owen Mining Co. made the first shipment of uranium ore from Kern County's west side in July. Company shipped 46 tons of upgraded ore, expected to assay at 0.20% or better, from Maricopa to Vitro Corp., Salt Lake City. Ore was from claims near Midway Peak in the Temblor Range, 25 miles north of Maricopa.

Company holds approximately 800 acres in claims. Initial discovery was made by Howard Owen, Taft, in August, 1955. Subsequent work included sinking of 35-ft shafts, which were abandoned in favor of open-pit mining with bulldozers. Property has been core drilled to a depth of 70 ft. Upgraded samples have assayed as high as 0.366%.

Partners in Owen Mining Co. are L. L. Curyea, Pearl M. Parady, Howard and Ella Owen, Henry E. and Vera Baldwin, Charlie and Carmen Deemer, and Al and Inez Mitchell.

Surcease Mining Co., Atolia, San Bernardino County, reported return to normal operations following signing of the tungsten bonus price bill by President Eisenhower in July. Several sets of lessees had suspended operations on company claims prior to setting of new price. Surcease leases to about 70 men, milling the ore in return for a 50/50 split of the gross profit.

A uranium discovery has been confirmed on the Little Sparkler group of claims, directly across Kern River from the Miracle Mine, 36 miles northeast of Bakersfield, Kern County.

Prospectors followed out a vein some 400 ft by a series of pits. An access road has been completed to the claims from Isabella Dam. Work to date indicates a "substantial" structure. Little Sparkler claims are owned by Allen B. Lloyd Scouler and Rufus E. Cook of Bakersfield.

Alaska Juneau Gold Mining Co., headquartered in San Francisco for more than half a century, has shifted its offices to Los Angeles.

The move follows elevation of a Los Angeles publisher, Charles J. Ver Halen Jr, to the president's chair. He waged a successful proxy campaign, wrestling control of the firm from a management headed by C. A. Norris, who served as president. The veteran gold mining firm has an inactive mine in Juneau, Alaska.

COLORADO

Harold Knutson, Durango miner, says that three winters of working alone high in the La Plata mountains has finally paid off. He has been working the Muldoon silver mine at an isolated site since 1953 for owners Herman Todeschi and Herman Dalla, also of Durango. Todeschi says Knutsen has hit a high grade streak of silver ore that has essayed at 14,649.79 oz silver and 8.21 oz gold per ton of ore. Todeschi said extent of the discovery hasn't been determined. The owners pack supplies to Knutson each summer, the only route to the mine site during the winters was a 14-mile hike on snowshoes.

Atlas Uranium Corp. reported in July it was stockpiling 50 tpd with 2 three-man crews from its base metals operation near Crested Buttes. New Atlas mill at Crested Buttes was scheduled to begin operation in late August, president J. C. Burgess said.

Juniper Oil & Mining Co., Denver, has established a fellowship at Montana School of Mines for study of beneficiation processes for low-grade uranium ores. The fellowship will be available to a graduate student working toward a master's degree in ore dressing, and information obtained will be made public.

John Blixt, president of Juniper Oil & Mining, is a graduate of Montana School

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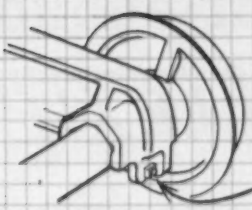
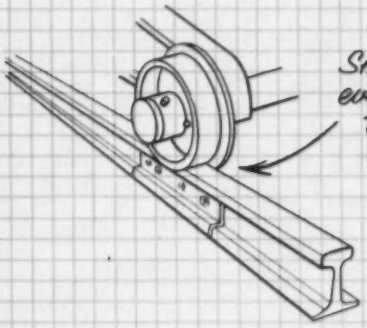
For over 60 years Manufacturers of Spang Weldless Jars and a Complete Line of Cable System Drilling and Fishing Tools for Oil and Gas Wells, Prospect Drilling and Shot Blast Holes.

Movement between bolster and side frame is taken on specially designed wear surfaces

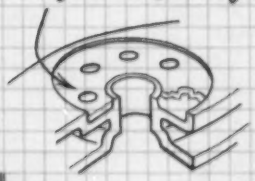


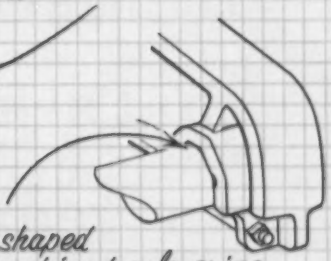
Quick wheel change



Smoother ride even on rough tracks

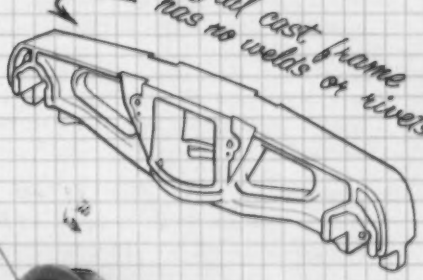
Large center bearing for longer life



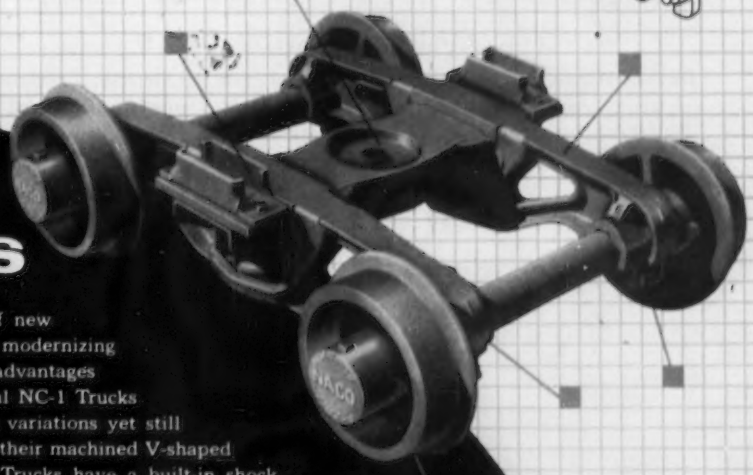


V-shaped machined axle grips for controlled flexibility and truck alignment

Integral cast frame has no welds or rivets



Check these "plus" features OF NATIONAL NC-1 TRUCKS



If you're considering the purchase of new 8-wheel mine cars . . . or if you're thinking of modernizing older cars—*now* is the time to check the advantages of National NC-1 Trucks. National NC-1 Trucks have controlled flexibility for track variations yet still maintain truck alignment through their machined V-shaped axle grips. In addition, NC-1 Trucks have a built-in shock absorbing mechanism.

You get more out of your mine car investment per workshift . . . per day . . . per year. And at the same time you minimize spillage . . . get greater protection for your equipment, track and structures . . . slash maintenance to a new low.

Yes, *now* is the time to check National NC-1 Trucks—they make sense for 8-wheel mine cars . . . *make dollars for operators, too.*

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Colorado *(Continued)*

of Mines. Ore for experiments in connection with the fellowship will be supplied from the Tallahassee Creek area near Canon City, Colo.

Utaco Uranium Inc., announced first shipment of lead-zinc concentrates from its mill near Ouray was made in July, and said the company hoped to maintain a 50-ton per week concentrate shipping schedule. Ore is from Utaco's Bradley mine near Telluride. Shipments from Utaco's Allen No. 2 mine in Red Canyon, San Juan County, Utah, in June totaled 640 tons.

Moab Uranium Co., now of Grand Junction, announced it has exercised option to purchase the Golden Wonder gold mine and the Gnome and Detroit base metal properties near Lake City. C. M. Hickman, executive vice president of Moab Uranium, claimed independent engineer's report estimated value of Golden Wonder reserves at around $7-million.

Moab Uranium will have one-fourth interest in the three properties, with other 25% interests being held by R. A. Pitzer of Grand Junction, L. D. Norris of Deer River, Minn., and A. F. Norris of Perry, Mo.

Lisbon Valley Uranium Co., Denver, announced late in July it has acquired a 50% net profit working interest in a lease and option on properties owned by John A. Smith at Silver Plume, Colo. The lead-silver-zinc properties include 123 patented and 10 unpatented claims, Lisbon Valley announcement said. A 75-ton mill included in the deal will be enlarged to 150-ton capacity.

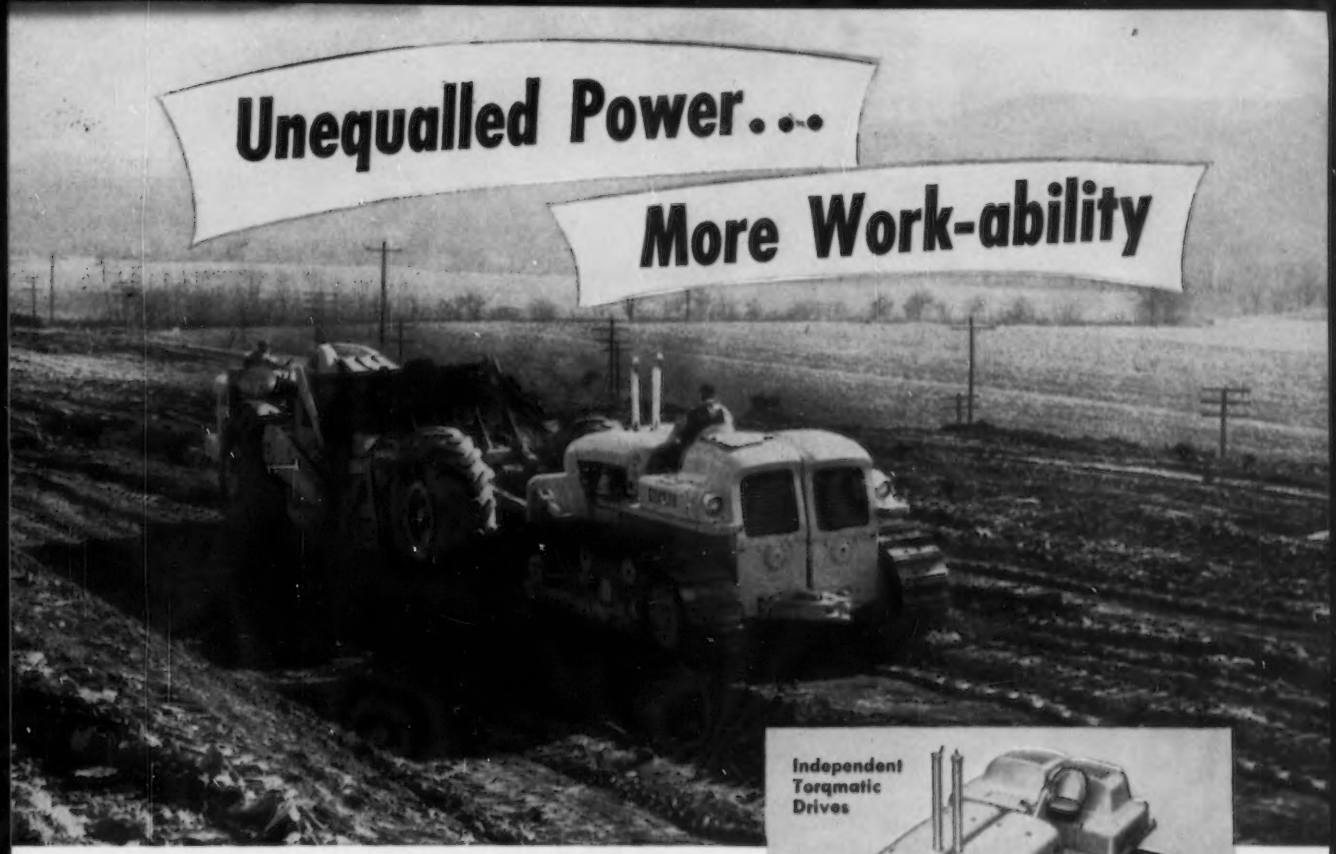
Atomic Energy Commission now employs about 550 people in Grand Junction and about 1,300 are working under direction of the Grand Junction Chamber of Commerce July 27. It was said the same payroll would be continued for the foreseeable future, although AEC has cut back exploration activity and is concentrating on administrative work.

A 440-acre site has been staked for the new mill to be built at Bedrock by Atomic Fuel Extraction Corp. AFEC president Jack Turner said Western-Knapp was expected to complete preliminary engineering work about Sept. 1.

Considerable work is being done at the Johnnie Bull mine, two miles above Silver Plume. Both assessment work and additional development work have been under the direction of George Rowe. He states that recent ore samples have assayed 560 oz silver per ton. A sample cut over 36 in. width of vein material showed 138 oz silver. "It looks very promising" said the superintendent.

Stockholders of Universal Oil & Uranium Corp., Denver, heard good news at their annual meeting. Paul W. Mohr, president, reported that production at the firm's lead and silver mines in its Red Elephant group of 61 claims near Lawson in Clear Creek County, was running some 60 tons a day. Tabor mine production is at 40 to 50 tpd of $38 ore. At the Girt mine,

Unequalled Power...
More Work-ability



with the "Euc" TC-12
Twin Crawler Tractor

Here's a completely new concept of tractor design and performance... the TC-12 Twin-Power Euclid. It's designed and built to deliver more power, easy operation and greater work-ability—plus exceptionally fine accessibility for servicing. Power train components are matched and job proved with years of dependable performance in heavy earth moving equipment.

Powered by two 194 h.p. engines with separate Torqmatic Drives, the TC-12 gives a smooth, steady flow of power to meet every job requirement. There's no master clutch and no manual gear shifting. Three speed ranges in forward and reverse are available by simply moving a selector lever... top travel speed is 8.3 m.p.h. The TC-12 has good stability and traction on rough ground because each half of the tractor is separate and free to oscillate ... the two halves can be easily separated for shipment. Write for detailed specifications.

EUCLID DIVISION, General Motors, Cleveland 17, Ohio

Tremendous power, speed and maneuverability make the TC-12 a top performer in heavy duty mine and quarry work. No other tractor matches its production in stripping overburden, clearing, stockpiling, building haul roads, and other big tractor jobs.

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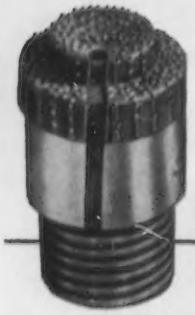

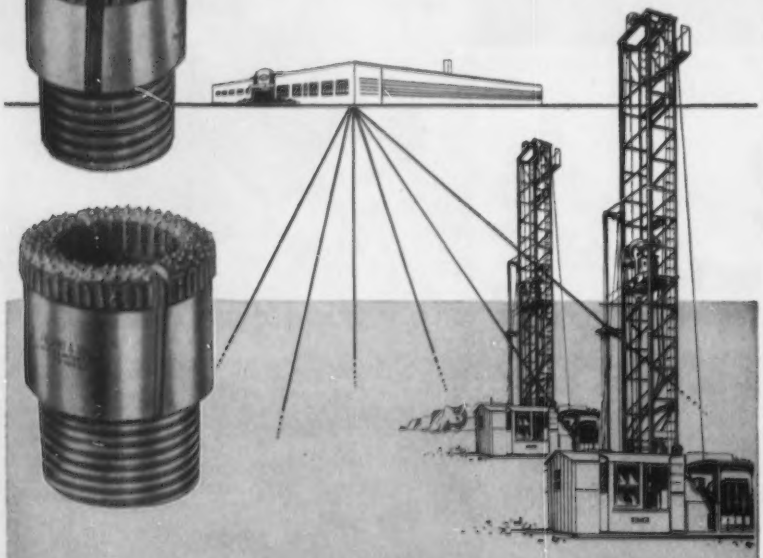

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Colorado (*Continued*)

8 to 10 tpd of $100 ore is being turned out. Kitty-Clyde mine in Spring Gulch is producing four to six tons a day of $150 ore, reports Mohr.

Cresson Co., Cripple Creek, reports the 2201 stope is completed and ore is being drawn out from it at the rate of approximately 200 tpd. Tonnage for the first five months of 1956 compared to the first five months of 1955 is higher, but average grade is lower. Development work is now in progress on the 23rd-level to ascertain if the ore goes down from this 2201 stope to the next lower level.

The second big uranium discovery in the Gunnison area appeared to be in prospect as Vulcan Silver-Lead Corp. shipped a five-ton sample shipment of ore containing uranophane rock to Climax Uranium Co.'s mill in Grand Junction. Manager James E. Dunn of Vulcan, a subsidiary of Callahan Zinc-Lead Co., said it represented surface outcroppings from their 6,000-acre Indian Creek prospect northwest of Marshall Pass on the Continental Divide. This first truck load culminates nearly a year of prospecting effort by Vulcan personnel in the Marshall Pass area.

Vitro Corp. has a crew doing exploratory work on claims located by the Three Forks Oil & Uranium Co., north of Columbine. Preliminary examination has indicated a rich body of manganese ore at shallow depth and the Vitro work will determine how much ore is available. The Three Forks company has about 130 claims located in the area. Bulldozers and other heavy equipment are being used.

The Silver Shield mill at Ouray, Colo., idle for several months, again is crushing ore. Utaco Uranium Inc. of Moab, Utah, took a lease option on the mill last winter. Bill Hines, Utaco secretary-treasurer, said preparations for full-scale operation have been completed and the mill now is handling about 50 tpd. Output soon will be stepped up to 100 tpd, he said.

Bald Eagle mine in Virginia Canyon, Clear Creek County, continues to ship high grade lead and gold ore, the gold content assaying from 3 to 14 oz per ton. A mill site of 80 acres has been obtained just below Idaho Springs and a 150-ton mill will be erected.

IDAHO

Northwest Uranium Mines Inc., has resumed exploratory drilling on its uranium prospect on the Spokane Indian reservation in Southern Stevens County, Wash., under a $29,160 contract approved by the Defense Minerals Exploration Administration late in June. The program, in which the Government is participating to the extent of $21,870, calls for some 100 to 150 shallow percussion holes to depth of about 100 ft and an additional six diamond drill holes about 250 ft deep, for the purpose

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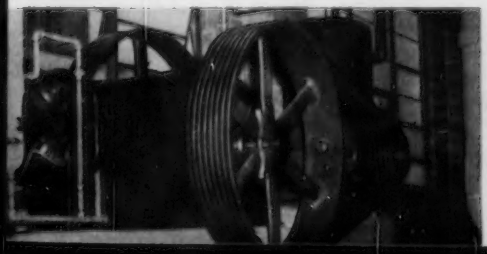

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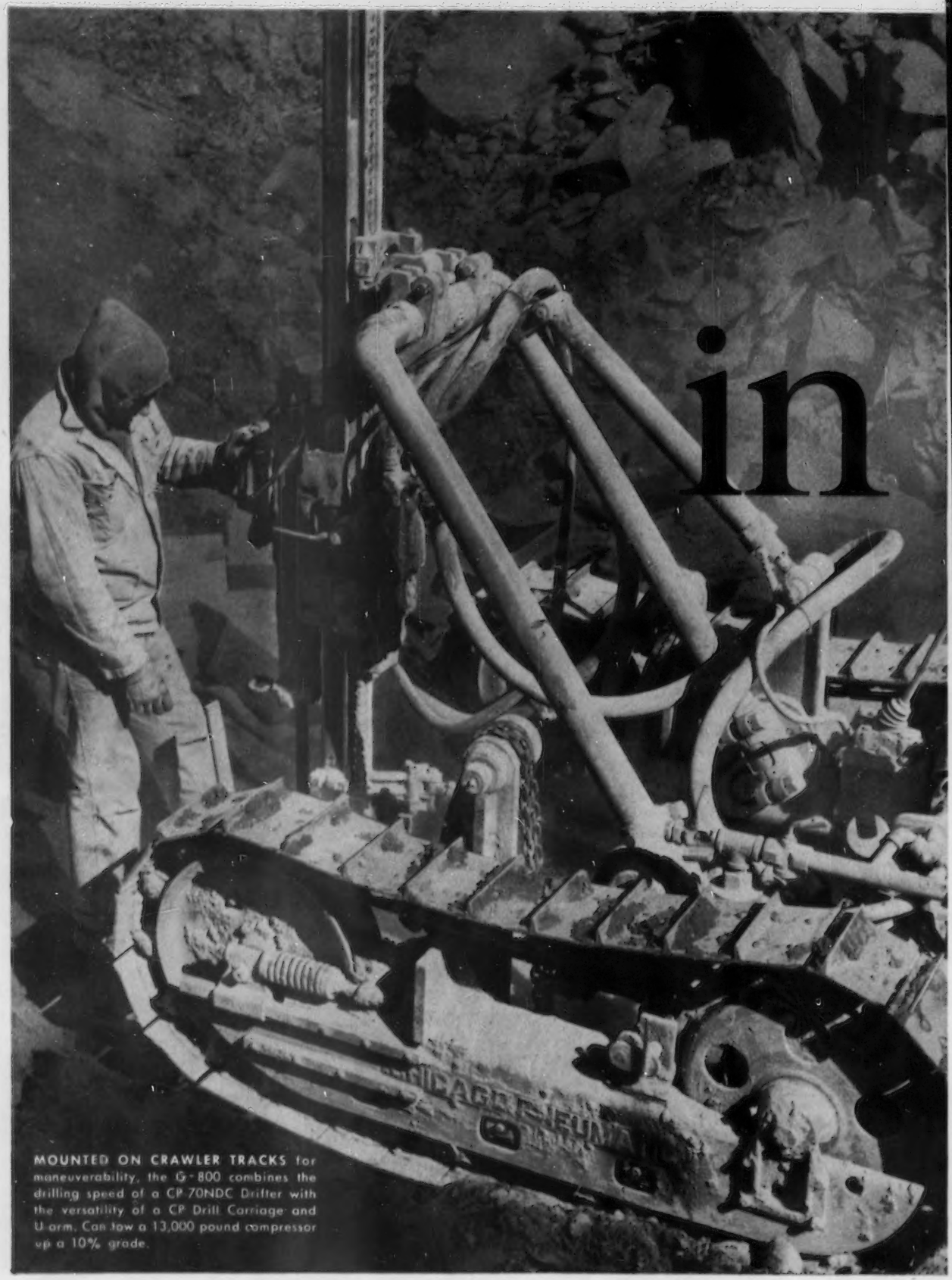

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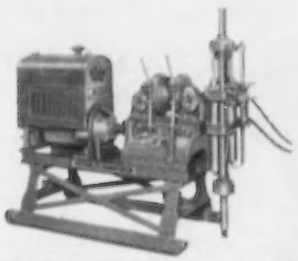

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of delineating the pattern of mineralization previously indicated by trenching and early drilling, and determining its limits and extent.

Nineteen of the first 20 percussion holes put down encountered ore of varying grade and thickness at less than 100 ft of depth over an area about 750 ft from north to south and more than 900 ft from east to west, indicating the possibility of a large ore deposit adaptable to open-pit mining methods.

Northwest Uranium is the operating company for Silver Buckle, Fortune and Eastern Lead mining companies of Wallace, Pathfinder Uranium, Salt Lake City and Stansbury & Associates, Spokane. A merger of Pathfinder into the operating firm has already been approved by Pathfinder stockholders and similar action by Fortune and Eastern is reported to be under consideration.

Sunshine Mining Co. reported recently to stockholders that it is dissolving its joint venture with Denver Basin Petroleum in the Prewitt oil field in the Denver-Julesburg Basin of Colorado in favor of an operating agreement under which the two associates have taken in a third group in the drilling of 10 wildcat wells in the area during the remainder of this year. Previous drilling in the area had brought in three producing wells.

The Sunshine firm also has an interest in 167 producing wells in the Buck Lake-Pembina fields of Alberta, Canada, and revenues from oil production are beginning to take up the slack resulting from declining ore production from the big Sunshine silver mine in the Coeur d'Alene district between Wallace and Kellogg.

Mine production for the first half of this year totaled 104,912 tons, including tonnages taken from adjoining properties operated by Sunshine under profit-sharing agreements. This compares with an output of 113,438 tons in the corresponding period of 1955.

American Smelting and Refining Co. has started preparations for sinking four compartments of the main shaft at its Page Mine west of Kellogg from the 3070 to the 3400 level. The Page shaft is a 55-deg incline.

At the present time production from Page, which is AS&R's biggest operation in the Coeur d'Alene District, is coming principally from between the 2400 and 2770 levels. Operations between the 3070 and the 2770 are largely development—establishing an intermediate level and driving the necessary raises to prepare the ground for stoping.

Stauffer Chemical Co., big producer of phosphate fertilizer, has purchased a 50% interest in the San Francisco Chemical Co., one of the pioneer mining firms in the Rocky Mountain area and a major producer of phosphate rock in southern Idaho, from its parent firm, Mountain Copper Co., Ltd. of London, England.

San Francisco Chemical at the present time operates a mine at Montpelier, Idaho, and has developed large reserves

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URANIUM REDUCTION CO.'s mill at Moab, Utah, is one of the central factors in the discussions surrounding adequate mill capacity for the Big Indian District's uranium ores. Ute Milling Co. and Continental Uranium are also concerned.

AEC Wraps Up Uranium Mill Contract *(Continued)*

ore, however, during the 12 months before their Wyoming plants become operative.

The problem of the Ute Milling Co., which are near resolution one way or the other are briefly these:

It is stated that the company and the commission have arrived at an understanding as to price of uranium oxide to be delivered. There will be too much capacity for ore reserves now known in the Big Indian District if Ute Milling proceeds with its program and the Moab mill of Uranium Reduction Co. is run anywhere near capacity.

This situation has caused Continental Uranium Co. to defer any contract action on its smaller mill at La Sal. Robert Pruess, general manager of Continental, has said flatly that if Ute Milling proceeds with its program, Continental will drop its milling plans.

It is understood, in meantime, that Ute Milling and Uranium Reduction Co. have been in close negotiation on solution of the problem.

No details on variety of proposals have been released. It is obvious that a decision is imminent on whether Ute will proceed with its mill, however, as time is running out on amortization allowances by Government.

Idaho *(Continued)*

on Stauffer claims and leases near Hot Springs, Idaho. The firm also operates a Stauffer-owned claim in southwestern Wyoming. It has been the primary supplier of phosphate rock for Stauffer plants for several years.

Metropolitan Mines Corp. has completed the first mill run of ore from the Old Black Bear Mine in the Canyon Creek area of the Coeur d'Alene District near Gem and has shipped 37 tons of zinc and 27 tons lead concentrates recovered from the stockpile of development ore accumulated in the process of reactivating the former producer. Further development of the lead orebody previously opened through the No. 1 raise is now in progress with the objective of increasing production to the point where it will yield about two 50-ton cars of lead concentrates per month.

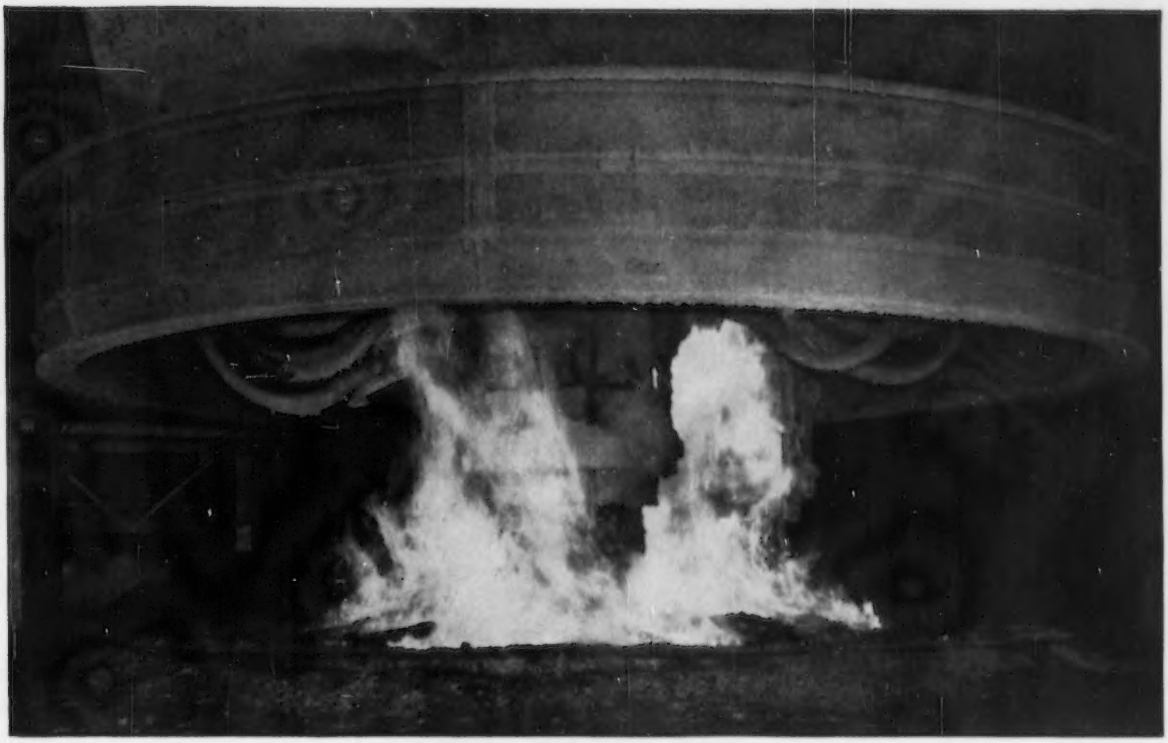
Senator Silver-Lead Mines Co., Ltd., has resumed exploration work at the old Black Horse Mine on the North side of the Coeur d'Alene District east of Murray. Road building, which also serves as trenching exploration, is now in progress to provide access to old tunnel workings through which additional exploration and development work can be undertaken.

Bulldozer work has already uncovered one mineralized zone and will soon cross a surface outcrop of good carbonate lead ore, officials report.

Discovery of a new uranium prospect on the south fork of the Clearwater River in Idaho County was reported late in July by Walter S. Campbell of Lapwai. Samples from the surface outcrop of the mineralized zone assayed only 0.087% uranium oxide, but a tunnel 15 ft beneath the outcrop yielded samples which ran 0.32%, he said. The assays were made by the AEC.

North Idaho has vast resources of clay which could be valuable to a variety of industries, according to a new Idaho Bureau of Mines and Geology report compiled by Charles R. Hubbard, bureau mining engineer.

Report says known clay occurrences extend from Coeur d'Alene on the north to Grangeville on the south in a belt 50 mi wide by about 130 miles long. Deposits of possible ceramic quality have been noted in railroad and road cuts and along stream beds in Kootenai, Benewah, Latah, Nez Perce, Lewis, Clearwater



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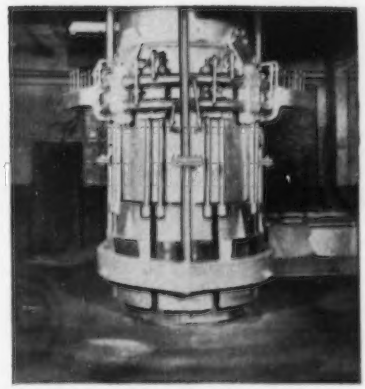

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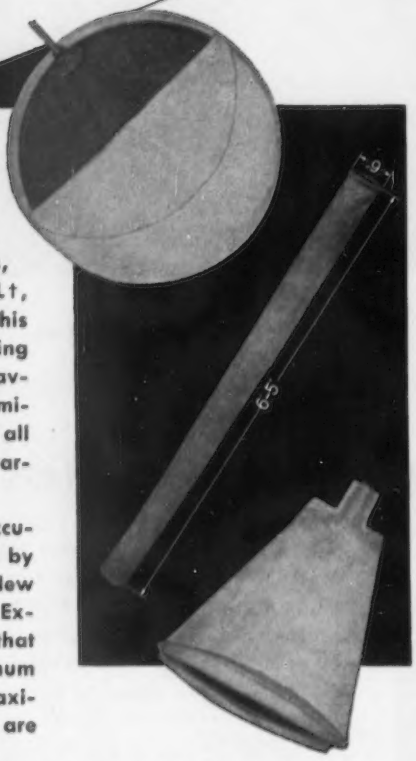

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Idaho (*Continued*)

and Idaho Counties, but their extent has not been determined.

In Latah County, enough drilling has been done to indicate 250-million tons as a conservative estimate and there may be as much as 500-million tons present.

MINNESOTA

Two large open pit iron bodies are being developed by the Oliver Iron Mining Division this season: Sauntry at Virginia and Stephens at Aurora, both on the east Mesabi Range. Stephens was operated by Oliver (1903 to 1905) and shipped 454,819 tons. Available reserves are estimated at 20,832,000 tons. In addition, the Stephens reserve contains an estimated 27,248,342 tons. Two properties are sufficiently segregated so that, eventually, they may practically form one large pit.

Sauntry property, which is composed of eight forties, has an estimated reserve of 26,971,746 tons. Total shipments from the mine have been 5,705,581 tons, much of which has been mined by adjoining Columbia (J&L) and Enterprise (M. A. Hanna Co.) mines. Sauntry was originally opened in 1899 by American Mining Co. and operated by Oliver in 1902 and again from 1917 to 1929. Both mines contain a good grade of ore.

Steep Rock Iron Mines, Ltd., was shipping at a rate that could have produced well over 3-million tons for the season when interrupted by the steel strike. From 12- to 14-million tons of iron ore production from all Lake Superior mines was lost by the month-long steel strike. Because iron ore shipments are practically confined to ore boat haulage on the Great Lakes, this large tonnage cannot be made up.

The annual report of Itasca County mine inspector, Bernard G. Hurley, for 1955 shows 3,631 men employed with two fatal accidents and 60 men injured in non-fatal accidents. There was a production of 16,292,831 tons of ore from 47 open pit mines (no underground operations) and 16,348,705 cubic yd of stripping removed: approximately one cubic yd for each ton of ore produced. Average daily wage per man-day was $14.85.

Oliver Iron Mining Division of the U. S. Steel Corp. has issued a statement relative to its activities in the Lake Superior iron ore district which contains the following information. Total employment as of June 30, 1956, was 7,199. These employes were divided as follows: Virginia-Eveleth district 3,230; Hibbing-Chisholm district, 2,390; Canisteo district, 1,092 and Duluth general office, 487. Total monthly payroll for these districts approximately $2.9-million. About 1.2-million tons iron ore were shipped per week. In addition to these, the American Steel & Wire Division's Duluth Works employs 3,500 with a monthly payroll of over $1-million. The Universal Atlas Cement Co.'s Duluth plant has 325 employes. About 85% of Oliver Iron

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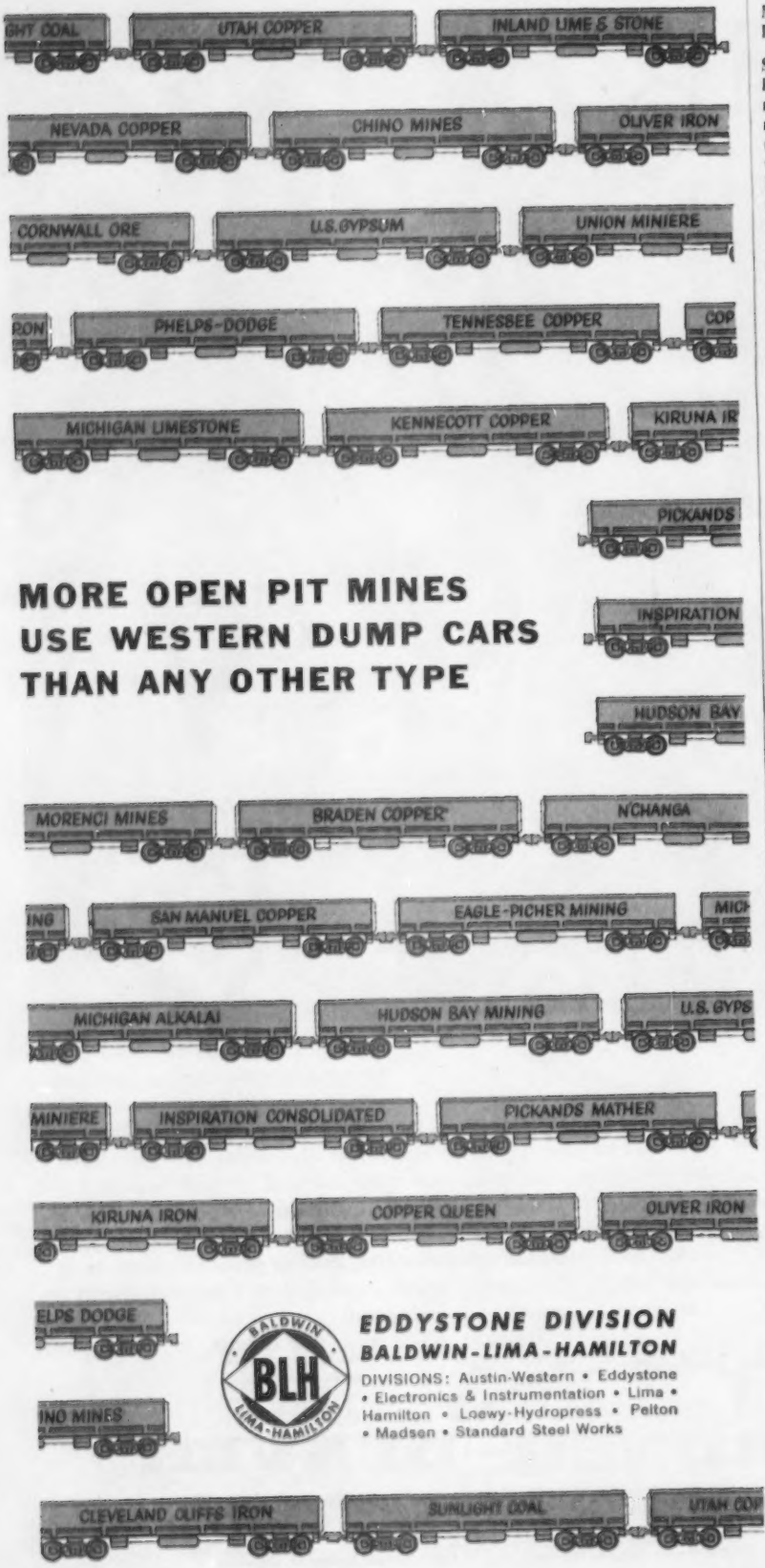

Minnesota *(Continued)*

Mining Div. and American Steel & Wire Division were affected by the strike.

Steep Rock Iron Mines, Ltd., directors have authorized an expenditure of $25-million for further expansion of their mines. This additional fund is to be used for opening up three new mines which are expected to be in production by 1960. Cyrus Eaton, chairman, who made the announcement, said that Steep Rock officials feel fortunate in having the Inland Steel Co. come in to develop one of its orebodies. He said that "together we will spend $60-million in mine expansion during the next three years."

The new Douglas mine (M. A. Hanna Co.) heavy density plant is now completed. Plant has both coarse and fine ore units and is designed to handle custom ores as well as ore from the Douglas group. Construction of the plant was begun in July 1955, and the coarse ore section was ready for the 1956 season. Fine ore section was completed in June, just before the mine was shut down because of the steel strike.

During the week ended on Monday, July 23d., a total of 260,937 tons of ore was loaded into ore boats at Lake Superior ports. This, as well as other ore dumped since the strike was called on July 1, was loaded at the mines before that date and classified as ore in transit.

Total ore sent to the docks as of July 23 was 33,450,922 tons, compared to 37,713,290 tons on the corresponding date in 1955. By the time ore shipments again reach normal, the 1956 season will probably be over 7-million tons behind 1955.

KENTUCKY-ILLINOIS

Fluorspar producers of the Ill.-Ky. mining district anticipate renewed activity in prospecting and development work along with reopening of shut-down mines as a result of the Government's recently announced stockpiling program. Many mines in the area have been idle in recent months with operators maintaining that they were unable to meet unfair competition from Mexican imports.

Efforts toward increased tariff rate or import quota have been pushed vigorously in the last two years by the Independent Domestic Fluorspar Producers.

New program, based on a Congressional appropriation bill for stockpiling 250,000 tons of domestic acid-grade fluorspar over a 2½-yr period is expected to improve the tenor of the domestic market. All domestic producers are eligible to participate.

Announced stockpiling price is $53 per ton, f.o.b. mines, for acid grade as compared with the current market price of $47.50 per ton. It is understood that the General Services Administration will start buying soon.

Stockpiling of metallurgical grade fluorspar also is expected to get under way on order of the Office of Defense Mobilization. Purchase of 250,000 tons

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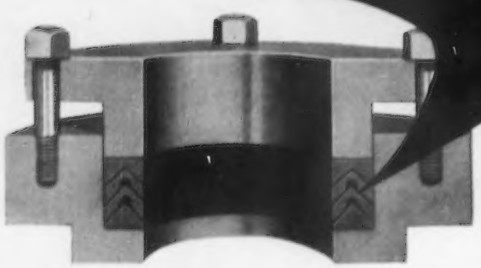

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Kentucky *(Continued)*

will be spread over a period of 2½ years. Prices will be $34.50 for 60% grade, $38.50 for 70%, and $39.50 for 72½%, f.o.b. mines, Rosiclare, Ill., area. The prices fixed are $5.50 per ton higher than the current market for metallurgical grade.

Producers presently have a quota application pending before the Office of Defense Mobilization, based on the allegation that foreign importation is damaging the domestic fluorspar industry to the extent of endangering national security. In view of the new stockpiling program, it is probable that the hearing, scheduled for Sept. 13, will be called off.

Discovery of two new fluorspar orebodies at the Extension Works, which has been idle since 1922, was recently made by Alcoa, Fluorspar Division, in the process of exploratory geological work at the Rosiclare site. Extent or nature of the discovery has not yet been defined. Part of the Extension fault runs under the Ohio River. Further exploration is planned.

Sinking of 225-ft shaft into a new bedded ore deposit, located five miles from Joy, in Livingston County, Ky., was started the last of July by Alcoa. Job is under contract to J. W. Patton and Sons, of Elizabethtown, Ill.

MICHIGAN

Interlake Iron Corp. has taken over the Globe Iron Co., Jackson, Ohio, and the Globe Metallurgical Corp., Beverly, Ohio. Globe Iron Co. was incorporated in 1873 and operated the Globe mine at Iron Mountain, Mich. until now. The mine shipped 51,290 tons in 1955.

MONTANA

Mining of the rich Yogo sapphire deposit near Lewistown, unworked since 1927, was scheduled to resume in August.

Control of the deposit has been acquired by Commercial Uranium Mines of Denver and Thomas P. Sidwell, Billings investor, through purchase of stock of the New Mine Sapphire Syndicate, a British organization.

Yogo deposit has been described by the U. S. Geological Survey as "the most important gem locality in the United States." Cut stones worth an estiamted $30-million were taken from the deposit between 1900 and 1927, when the British syndicate stopped work because of currency difficulties and double taxation.

Gold Syndicate Corp., Spokane has concluded an agreement with Key Uranium Inc., Conrad, Mont., for exploration and development of the former's four-claim uranium prospect on Rock Creek near Basin. Uranium-bearing ore was found last October on the dump of a gold prospect tunnel driven many years ago on the property. Atomic Energy Commission cleared the tunnel portal and re-

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"Clamshell cuts out hand labor"—Boh Brothers Construction Co., New Orleans, La. "If ever one machine could 'do it all,' our International Drott TD-9 Four-In-One Skid-Shovel is it," states Sam Venus, for Boh Brothers Construction Co., New Orleans, La. "Its clamshell action, for example, cuts out hand labor. We produce 150-175 5-yd. truck loads per 9 hrs." Watch the clam "surround" loose stuff—heap itself in one fast gulp!

"Loads 'high ones' others can't"—Mike Ferrantino, Dearborn, Mich. Mike Ferrantino, Dearborn, Mich., using his TD-9 Four-In-One, averaged loading 26 5-yd. trucks per hr., on a housing project. "I can load 'em from any angle, high tandems and all, with the high-reaching, bottom-dumping clamshell," he says. "My Four-In-One does so many jobs others can't do—even cleans itself of damp clay, dumping as a clamshell."

"Moves material where others quit"—Consolidated Construction Co., Bayside, Va. "Our International-Drott TD-9 Four-In-One will move material where other units quit," declares Consolidated Construction Co., Bayside, Va. "It's a multi-purpose rig, has high reach, and will out-load anything in its size class." Here they're getting accurate "carry-type scraper" action on a housing project, with Four-In-One in Bullclam position!

"Beats the others in job variety"—Leon Sumler, Memphis, Tenn. "With it, I can do a far wider variety of jobs than the others," reports Leon Sumler, Memphis, Tenn.—of his International-Drott TD-9 Four-In-One, shown tearing up old filling station slab and footings to load out. "The clamshell speeds the job," he adds, "and Drott bucket roll-back makes it possible to keep heaped loads. It's the one-tractor-man's ideal rig."

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Montana *(Continued)*

moved part of an underground cave-in to gain access to an ore exposure in a vein which appears to parallel the adit tunnel. Remainder of the cave-in is now being cleaned out to permit further investigation of the vein.

NEVADA

Consolidated Virginia Mining Co. will reactivate its holdings on the Comstock Lode at Virginia City. Inactive since the Government shut down gold mining operations in 1942, Con-Virginia properties have produced gold and silver valued at more than $220-million. New work will be done by open pit methods.

"Large values in gold and silver still exist on Consolidated Virginia's properties," Louis H. Seagrave, president, said. "Earlier operators concentrated solely on high values."

Company plans an exploration program to include drilling and open cut operations in virgin areas, sampling and metallurgical work to confirm previous assays. Program is being undertaken as the result of recent examination of the properties and research of documented reports, many not previously known to exist.

"The work planned may well lead to extensive operations at Virginia City," Mr. Seagrave said. "The time has passed for economical reopening of the older, deeper workings, but we can start at the top and go down with little risk or guesswork."

Company studies indicate that with present equipment and methods, and values of $20 to $30 a ton in gold and silver (which Comstock experts regard as likely), properties can be made highly profitable through open pit operations, with possibilities of striking much richer deposits.

Another new activity being undertaken is the exploration of the huge dumps on the property. Arrangements have been made to test a new recovery method with the objective of recovering gold and silver values estimated at several million dollars.

The Comstock Lode was first discovered in 1859, and saw its most feverish mining activities in the 1870's. Con-Virginia's properties were worked on the upper levels by various lessees from 1925 to 1936, and in 1939 the company erected its 100-ton flotation plant, and profitably processed ore from an open pit. This successful operation was continued until September 1942 when a wartime Government order stopped all U. S. gold mining.

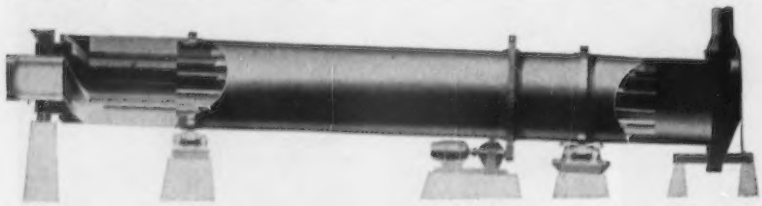
Titanium Metals Corp. of America is in the process of acquiring a 15-year lease on the Henderson plant and properties of Pioche Manganese Co. Lease will include the power, water and utility rights of Pioche Manganese. Negotiations, which are being conducted between attorneys representing the two companies, are expected to be concluded shortly.

Addition of 75 acres brings Titanium's Henderson holdings to 300 acres, making it one of the largest plants in the Henderson area. TMCA is already the largest employer, having more than 1,100 employees.

This move is consistent with Titanium's recent announcement of the expansion of its production facilities by 67%. Company officials stated that there were no present plans for building or land utilization, however.

Bristol Silver Mine near Pioche is producing 40 tons of good ore daily which is being shipped to Salt Lake City smelters. Strike vein is between 10 and 15 ft wide and is located on the 500-ft level. C. M. Christensen, secretary-treasurer of the company, says assays are running about 116.95 oz silver per ton, and the miners are developing up from the 500 level. They have progressed about 100 ft, much of that being development work. Actual output of ore is expected to increase in the near future.

Work is nearing completion on construction of a new road to the Morning Jewel mine in Pershing County. Road leads in from Buffalo Valley and was built following completion of a 10-year lease and option deal by Marion Fisher, owner of the Nevada Motel in Battle Mountain. Leasers were Frank and H. E. Waller, of Lovelock and Ted Johnson and Blain Holt, of Battle Mountain.



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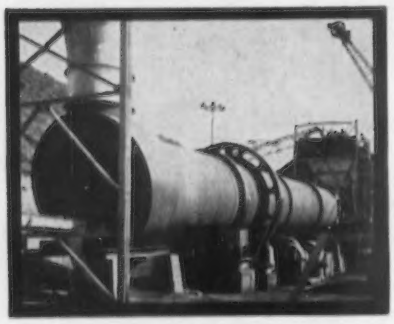

10′ diameter, 80′ long "XH" Ruggles-Coles Dryer drying bauxite.

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Nevada *(Continued)*

Property consists of seven tungsten claims located 65 miles southwest of Battle Mountain and 75 miles east of Lovelock. Region has become active recently as the scene of tungsten and mercury developments. Rich manganese has also been found in the area.

Apex Uranium Inc. is sending ore at an average of three truck loads daily to the railroad in Battle Mountain for shipment to the Vitro mill. Ore is averaging 0.30% and returning $45 per ton. Two 8-in. drill holes have been driven into Adit No. 1 in the mine for ventilation, and a prospect hole has been put down which hit water at the 130-ft level. This hole has been cased and is being used as a well, relieving the water shortage which has been hampering operations at the site. Bulldozing on the Western Soldier group of the Apex claims has cut a contact in which a strong anomaly was encountered, and work is now in progress stripping off overburden and constructing roads to the site.

Belco Petroleum Corp., N. Y., has acquired the Cahill Mercury Mine in Humboldt County where 25 men have been at work during the last several months turning out a large amount of ore. Belco has announced plans to increase the housing facilities at the mine and to hire 14 more men as soon as that is done.

Index Daley Mines Co., Salt Lake City has started new tunneling operations in the Black Forest mine on Spruce Mountain, 44 miles southwest of Wells. George Rich, Mountain Home, Ida., engineer in charge of the work, says the ore contains lead and silver with an interesting showing of copper. Work being done consists of by-passing extensive previous tunneling to drive a new tunnel. Four men are at work on the project and housing is being built for men and equipment.

Anaconda Co. has taken over the Hall molybdenum mine 24 miles north of Tonopah in Nye County on a lease and option agreement with the owners, Clarence Hall, Bishop, and Lee Hand, Tonopah. James R. Wilson, regional geologist in charge of the western exploration office of Anaconda is in charge of the project, says Anaconda will have a diamond drill on the property in the near future and start development work under direction of Kenneth Jones.

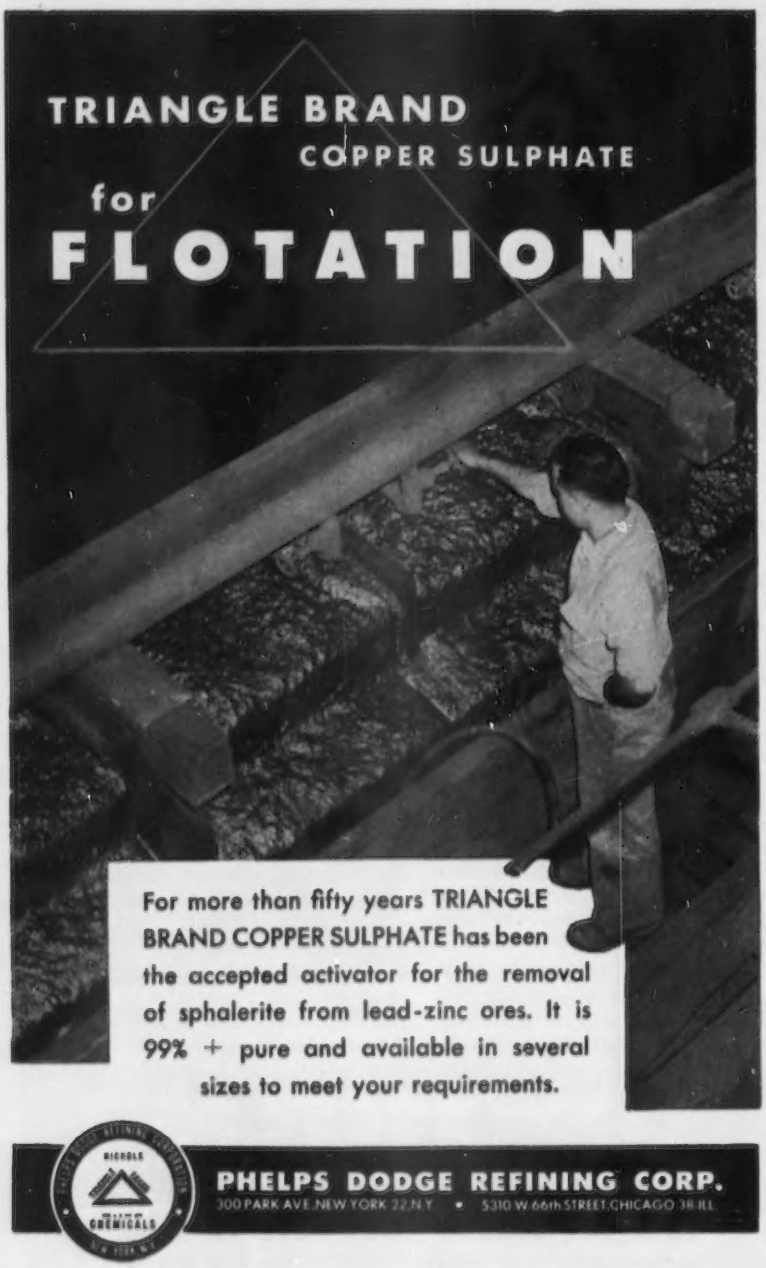
Dodge Construction Co. is mining and shipping 15,000 to 20,000 tons of iron ore each month from the Ford claims 22 miles from Lovelock. Ore is hauled to the Southern Pacific rail head at Lovelock for shipment to Japan. The ore contains 60% iron, and is rich enough to stand transportation costs to four Japanese smelters. This is the largest iron ore producer in the state, and since 1951 has produced more than a million long tons.

Mullen-Buckley Uranium Corp., Los Angeles has leased a large mercury deposit in Lincoln County from the Western Mercury and Uranium Corp., Las Vegas. A large exploration and development program has been carried out, and an ore body 500-ft wide and 300-ft long is reported to have been blocked out. Frank Mullen, of Beverly Hills, president, and Allen F. Buckley, vice president of the company, say orebody has been drilled to a depth of 100 ft, and that assays show high values. Property consists of 23 claims not far from Tempiute-Lincoln tungsten properties.

Kollsman Mineral & Chemical Corp.'s Philip M. Gardiner, resident manager of Kollsman Mineral and Chemical Corp., owners of the B & B Quicksilver Mine in Fish Lake Valley, Esmeralda County, Nevada, reports as follows: eleven miles of road have been constructed from Highway 3A, at an elevation of 5000 feet, to the B & B Mine, at an elevation of 8000 ft. Erection of a quicksilver treatment plant is about 80% complete and consists of a crushing plant which reduces the ore to minus $\frac{3}{16}$ in., a large rotary retort furnace, auxiliary facilities, an 850-ton steel ore bin and a diesel power plant of 600 hp.

Mining will be by open pit, using bulldozers and slushers and that no drilling or shooting is contemplated.

Consolidated Eureka Mining Co., Salt Lake City, has encountered an underground cavern approximately 70 by 150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Nevada *(Continued)*

ft in drifting on a sub-level before the 320-ft tunnel at its Eureka County gold-silver-lead property. The caverns are not unusual in the district but have never been encountered before in Diamond property of the firm.

OREGON

The quest for cinnabar ore and production of mercury from known deposits being reopened in central and southern Oregon continues to make the most active mining news in that state. Development work in the Black Hutte properties, 20 miles southeast of Cottage Grove and in a mine being reopened for the fifth time since 1890's, is gaining momentum at the 1100-ft level where an air compressor has been installed to operate machinery for drilling.

Furnace equipment is reported on order and a coarse ore bin under construction at the mine. Ricard F. Fischer, president of Mercury Chemicals Corp., the operating company, reports exploratory drilling is being pushed with the crew of 40. Production is scheduled to begin in November.

Active at the property are Daniel J. Mills, president of Quicksilver Syndicate, that leases the property to MC, and son of Fred Mills, who founded the syndicate group in 1927; Herbert J. Larsen, superintendent; and John E. Johnson, foreman.

Shawano Development Corp., the Florida holding company interested in mining and chemical production, is active at the former Bretz mine in southern Malheur County in southeast Oregon. This involves reactivation of the Opalite mining district. Comstock Uranium Co. is preparing to handle the ore milling and mercury production; Shawano the mining. The mine was last operated in 1940.

Lease of the Paramount claims on Greenhorn ridge, some 15 miles west of Sumpter, Ore., in one of Oregon's historic gold mining areas, is reported by R. E. Combs and A. J. Denis, both of Portland, who have formed Code Mining Co., Portland. Combs is president; Denis, secretary-treasurer. Denis reports the claims have been leased from Ingleman Helmer. A furnace is to be installed on the property. Code expects to recover mercury from the first run through the furnace and later recapture free gold from the furnace discharge, presumably by hydraulics.

Exploration work and some tonnage production is reported on two other prospects. John and Weyland Rouch, Lakeview, both co-owners in the White King uranium mine in Lake County, are developing low grade cinnabar ore on the Digmore claims on Salt Creek in Lake County. Cinnabar showings in Hope Butte area, near Bully Creek, are being investigated by crews for H. K. Riddle, Vale.

A year after Oregon's discovery claims of uranium bearing ore in the White King and Lucky Lass mines of Lake county, the state has now produced another prospect with ore sufficiently commercial to warrant AEC incentives. This was the report of Hollis M. Dole, director of the state department of Geology and Mineral Industries, who noted development work at the discovery properties was being pushed by Lakeview Mining Co. Another orebody was reported uncovered in early August on the claims at Lucky Lass. Lakeview has 27 men working three core drill rigs on double shift this summer. Aug. 1 they had logged 20,000 ft of drilling on the two leases plus those of Leehman nearby.

NEW MEXICO

Because of a declining demand for fire-refined copper, Chino Mines Division of Kennecott Copper Corp. has shut down its fire refinery, company officials announced recently.

With a large amount of refined copper stockpiled at the company's New Mexico plant. Kennecott is now casting all its output of metal as "blister" copper at the present time..

Company officials emphasized that if

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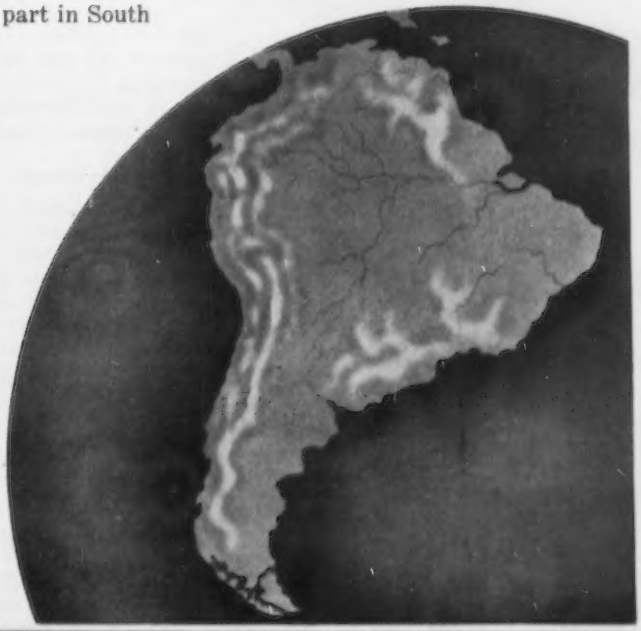

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New Mexico *(Continued)*

market conditions improve the refinery can be put back into operation quickly. None of the refinery's 65 employees has been laid off. The employees are being assigned to other jobs in the smelter for the time being.

UTAH

Salt Lake mining man, Samuel Arentz has given up option to operate the Mammoth mine in the Tintic-Eureka district. Mammoth Mining Co. officials now are reported in negotiation on operating contract for the gold-copper producer with United States Smelting Refining & Mining Co.

Uranium Reduction Co. officials said early in August they hoped test runs of the new processing mill being built at Moab can be started between Sept 1 and Sept 15, and that the plant will be in full operation by Oct 1.

Offices of Red Hill Uranium Co. were moved to Moab early in August from Tonopah, Nev. Move followed election of Jack Turner of Moab as president of Red Hill. New directors include Joe Dowd, Sr. and Joe Dowd, Jr. of Moab. Mr. Turner said Red Hill is starting a major expansion program, including purchase of one of the best known mines in White Canyon area.

The State of Utah is laying claim to mineral rights, (principal concern is oil, gas and uranium) on 101,610 acres of federally-owned lands in that state.

Utah State Land Board member Herbert F. Smart explains that a law passed May 12, 1919, by the Utah Legislature prohibited transfer of mineral rights on survey school sections (four in every township).

Subsequent to that date, some 101,610 acres located on Indian Reservations, national monuments and national forests were swapped by the state and Federal government with the state taking lands elsewhere which were certified to be non-mineral in character.

A part of the acreage (seven sections) is located near the big Aneth pool on Navajo Tribal Lands in San Juan County, Utah.

Smart, an attorney, says that: 1) either the transfer is illegal and the state has title to both surface or mineral rights, or 2) the surface transfer is legal, but recision must be made on the minerals.

In case of the Indian lands at least, the Navajos have been leasing to oil firms the disputed school sections. Now the State is granting oil and gas leases on the sections "as we have no alternative but to grant a lease if we feel the mineral rights are ours. The business of the State Land Board is to grant mineral leases," Smart says.

A conference was scheduled for July 18 at Washington, D.C. between US Department of Interior (including BLM and Bureau of Indian Affairs), Smart and assistant Utah attorney general Vernon Romney.

Shareholders of American Mining Co. have voted merger with East Utah Mining Co., Salt Lake firm associated with the Cranmer mining interest.

Under terms of the merger, already approved by East Utah shareholders, American stockholders would receive one share of East Utah for each 10 shares of America. An exploration program on American Mining's non-ferrous metals claims in American Fork Canyon, Utah County, Utah, is scheduled as result.

Standard Uranium Corp. reports discovery of an important new orebody in its properties in Big Indian District, San Juan County.

W. R. McCormick, Standard president at Moab, said the new ore is some distance from present mining operations and was encountered while driving exploration drift through barren ground.

The face is 15 ft wide. Several hundred feet of ore has been exposed on lateral length through cross-cutting and drifting which is continuing in effort to evaluate reserves. Grade appears average for the Standard mine, McCormick said.

Clyde E. Weed, president, Anaconda Co., confirms the firm's exploration department has encountered copper mineralization in core drilling in the National Tunnel-Utah Apex area of Utah's Bing-

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Ammonium Chloride, Reagent, A.C.S.
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Bromine, Reagent, A.C.S.
Filter Paper
Lead Metal, Reagent, A.C.S.
Lead Acetate, Reagent, A.C.S.
Lead Nitrate, Reagent, A.C.S.
Lead Oxide, Mono, Reagent (Litharge)
Potassium Chlorate, Reagent, A.C.S.
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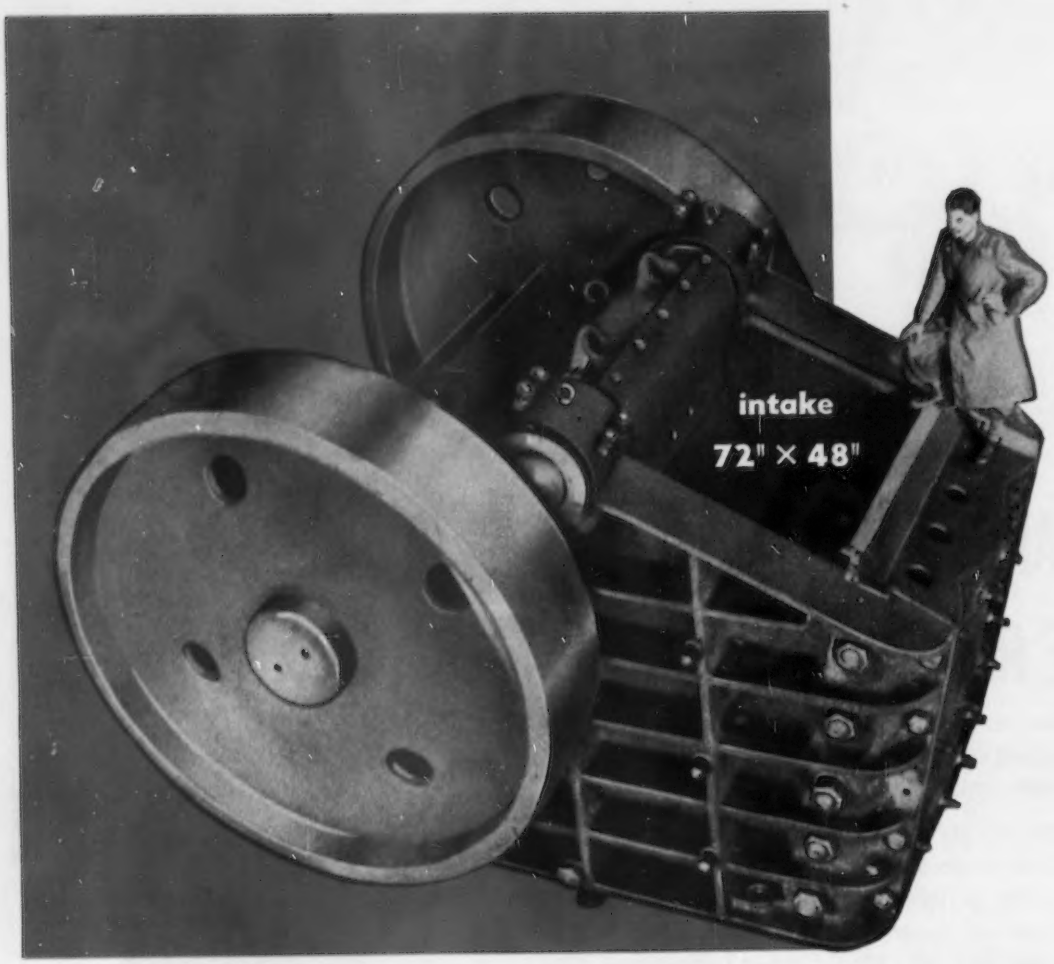

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SWEDEN

Utah *(Continued)*

ham district.

The Anaconda-controlled ground is adjacent to claims of Utah Copper Division, Kennecott Copper Corp., and that firm's big Bingham open pit. Mr. Weed said "it is much too early to speculate on the commercial possibilities in this area at this time."

The Anaconda chief, on tour of properties following his election as president of the firm, expressed confidence in the lead and copper markets and concern over future of zinc prices. He urged adoption of a penalty tax on excessive imports of lead-zinc metals similar to the plan which he himself suggested several years ago and which was adopted by the American Mining Congress.

Mr. Weed said that he could "never see why Washington had not approved this plan" inasmuch as Congress and the Administration appear agreeable to a similar plan affecting copper imports.

Mr. Weed confirmed that Anaconda's Jackpile mine at Bluewater near Grants, N.M., is competitive with uranium mines anywhere in the world because of its open pit nature. He said there was absolutely no waste in mining and that the property was removing about 12 tons of waste for each ton of ore.

He expressed the view that Anaconda's International Smelting & Refining Co., Tooele, Utah, lead-zinc reduction center was in better shape now than at any time during last five years.

But he remarked that operating ratios for the reduction center which serves a wide western area in lead-zinc mine output "were still pretty thin."

Weed also took occasion to criticize the "unreflective nature of the London Metal Exchange." He noted that metal volume was so thin as to be meaningless and he added that American companies produce 60% of the world's copper in this nation and South America, and that none of this output goes through London.

Unfortunately, he said, the London Metal Exchange prices seem to affect customer activity both in Europe and New York to a degree.

Mr. Weed said that copper at 40¢ a lb is about equal to the new price of steel on a commodity index basis. He amphasized that neither lead nor zinc prices had gained in relation to other raw material prices in the postwar world.

United Park City Mines Co. is in a position to move into a profit-making situation without impairing its big exploration and development program seeking new ore reserves in its Park City, Utah, lead-silver-zinc properties.

S. K. Droubay, general manager, said more than $1-million had been spent on exploration and development in the last year. The program was paid for out of profits without substantial reduction of working capital, which stood at $986,636 on June 30, 1956.

While the company reported a loss for initial six months of 1956, the month of July showed a profit, a trend which is expected to continue throughout remainder of this year.

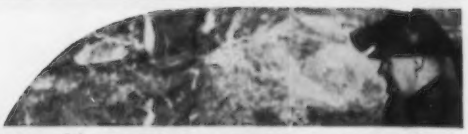
It is aim of the firm to hike output of ore from about 7,000 tons monthly to 9,000 or 10,000 tons a month in period ahead, Droubay said.

Output in recent months has been increased about 1,000 tons to 7,000 tons a month. Newly developed, richer grade ores from Ontario sector of the mine are largely responsible for this increase, he indicated.

Droubay also said that the million-dollar hunt for ore reserves had now reached a stage where the firm could reasonably expect discovery of important additions to reserves. He denied rumors that UPC already had developed a substantial new reserve in west end of the mine.

Delhi-Taylor Oil Co. now says it will decide within the next 60 days whether to make an immediate start on its multi-million dollar mine and beneficiation project at its potash prospect on Seven Mile Anticline northwest of Moab, Grand County, Utah.

D-T officials said a New York engineering firm was now completing an independent estimate of reserves known to be in hundreds of millions of tons



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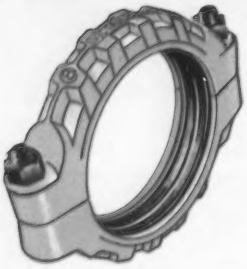

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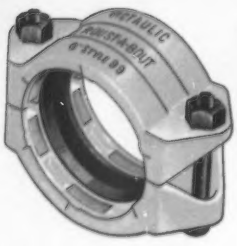

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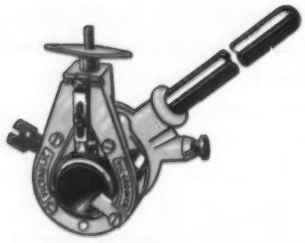

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Utah (*Continued*)

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Delhi-Taylor has finished its marketing analysis and reports that results were "excellent." Recent turn down in fertilizer prices has definitely taken some of the "polish" off this report, however.

WASHINGTON

Bureau of Mines Spokane field office is undertaking field studies of placer deposits for titanium, and will build an advanced model of a phosphate planing machine developed during the past several years by Spokane bureau personnel. Wing G. Agnew, Spokane office chief, said most of the titanium studies would be in Idaho. Phosphate device has been tested at a Montana phosphate development, and the advanced model will take the tests into account.

Loon Lake Copper Co., an early-day development first worked in 1918, may be revived as an ore producer. John J. Stalick, Spokane, and a partner, Ernest Lauakka, Chewelah, have investigated the property as part of 1000 acres on which they hold a lease and purchase option. The properties were sold in 1937 at a tax auction.

Stalick, a chemical engineer, says a specimen of dark red cuprite, blue azurite and green malachite assayed at the rate of $365 a ton. Records indicate considerable ore remains in the development, and Stalick estimates that dumps contain 3500 tons of milling grade ore.

Loon Lake mine, 38 miles north of Spokane, was discovered in 1888 during early railroading ventures in the district. Loon Lake Copper Company, organized in 1915, ran into financial troubles but sank a 500-ft shaft and shipped $125,000 in ore. Firm eventually paid $43,352 in dividends, but collapsed with the decline in copper prices following World War I.

Washington State College institute of technology has begun a study of rare earths in Ferry, Okanogan and Stevens Counties, to learn whether the state has commercial deposits of radioactive black sands containing rare earth elements. E. N. Klemgard, associate chemical engineer at the college, and R. S. Crosby, geologist, are conducting the search.

Gold Syndicate Corp. has contracted with Key Uranium, Inc., Conrad, Montana, for development of the Gold Syndicate uranium claims in Montana and Wyoming. Frank Lilly, Spokane, Gold Syndicate president, said uranium-bearing samples were found on an old gold mine dump on one of four claims in Rock Creek near Basin, Montana, last October.

The AEC cleared the old mine entrance and exposed the ore vein in a short off-shoot tunnel. Key Uranium will complete renovation of the mine and drill test holes in the uraninite vein, which seems to run parallel to the tunnel.

The nine Wyoming claims are in the Aloha group in the Gas Hills district.

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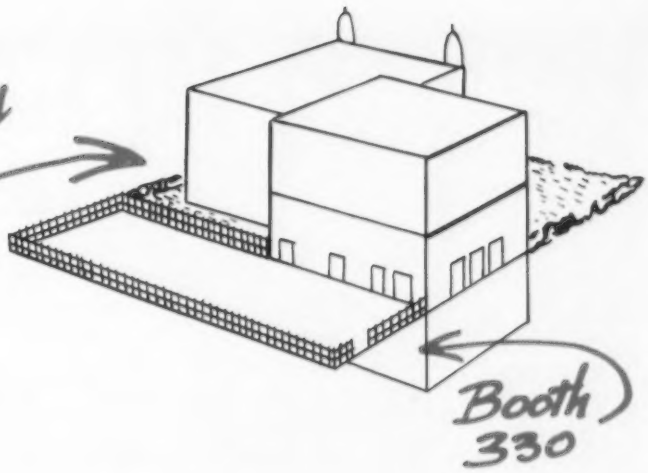

We extend a hearty welcome to those subscribers planning to attend the AMC Mining Show in Los Angeles. We hope you'll make it a point to drop by our booth and say "Hello."

Editors and others on our publishing staff will be on hand, and we'd consider it a privilege to swap ideas with you. We'll also have available copies of some of E&MJ's special editorial studies you may find useful.

Watch for Full Show Coverage in November E&MJ—Our 90th Anniversary Issue

E&MJ editors are planning a full-scale, comprehensive report of the AMC Show for the November issue—significant highlights of the convention program and a run-down of important machinery and equipment proving effective at today's modern operations.

Adding perspective to this panorama of present-day methods and equipment, E&MJ's November issue will take a quick look at mining's past and future, 90 years ago, and 90 years ahead. An illustrated summary will review methods and equipment in use in 1866, the year E&MJ first began publication. A panel of mining experts will wager their theories on what our industry may be like in 2046. The comparisons should be stimulating.

Our Show Report in the 90th Anniversary November issue is being planned for its practical, day-to-day value to readers. We think you'd find it worth careful study.

See you in L. A.

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Washington *(Continued)*

Dahl Uranium Mine, Inc., is the fifth firm to ship ore from the Spokane area. The firm has negotiated a contract with Vitro Uranium Corp., Salt Lake City, for shipment of ore which requires that each carload hold not less than 45 tons of uranium ore containing at least 0.25% uranium 308. First carload shipment went to Salt Lake City July 18. The firm plans not less than two carloads a week.

Dahl Uranium also has acquired 35,000 of the 185,000 outstanding shares of Universal Mining Corp. and is exploring Universal's property north of the Spokane Indian Reservation. Area includes 5200 acres of deeded land directly north of the reservation.

Universal Mining Corp., formed in May with a capitalization of $2-million to explore 5200 acres of deeded land north of the Spokane Indian Reservation, has elected Cline E. Tedrow as president. Tedrow had been consulting engineer for Grandview Mines, and for the past five years has been production foreman for Pend Oreille Mines & Metals at Metaline Falls.

Tedrow also is a consulting engineer and vice president of Mine Consultants, Inc., of Spokane.

The deeded property is a 41-claim group in the lead-zinc belt of the Metaline mining district and is the largest independent property in the district. It will be explored for uranium deposits by Dahl Uranium Mine, Inc., which holds 19% of Universal's stock.

The firm also has acquired property in the Slate Creek and Russian Creek areas of northeastern Washington, and has sunk one 650-ft drill hole for uranium near Russian Creek.

Other Universal officers include: Ted Grote, Enterprise, Oregon, vice president; and Mrs. Gladys McGregor, director of the pioneer Taylor Land and Livestock Co., secretary-treasurer. Stevens County properties were deeded to Universal by Mrs. McGregor, widow of a wheat and stock rancher.

Daybreak Uranium, Inc., has begun shipments from the Huffman lease north of the original Daybreak Mine in the Mount Spokane district. Kae Sowers, secretary-treasurer, said the shipments are in line with a company policy of shipping ore from properties eligible for initial production bonuses.

Daybreak has approximately 2000 tons of ore stockpiled at the Daybreak Mine, and has shipped 100 cars from development averaging 53 tons of ore. Eleven carloads in June averaged 0.44% uranium oxide and netted $32 a ton after freight charges.

Daybreak has also shipped five carloads from its Lowley lease on the Spokane Indian Reservation, and plans to resume these shipments after taking initial production bonus for ore from Huffman lease. A crew is also opening the Kit Carson development south of Daybreak Mine.

Western Knapp Engineering Co., San Francisco has been awarded a contract to build the 400-tpd uranium ore processing mill at Ford, Washington, 28 miles north of Spokane. Robert B. Fulton, manager of Dawn Mining Co., said work would begin immediately.

Western Knapp will build the mill on a cost-plus fixed fee basis and will complete it in about a year. Dawn, 51% owned by Newmont Mining Co., will spend approximately $3-million on the mill. Plant will be a custom mill, accepting ore from firms other than Dawn, but no steps have been taken to buy ore.

Dawn operates the Spokane area's first commercial uranium producer, Midnite Mine on the Spokane Indian Reservation. Ore from four other mines and Midnite Mine has been shipped to Salt Lake City for processing.

Mill and trucking operations will employ approximately 100 men when completed. Western Knapp was reported to be one of seven firms which bid on the construction contract, although Fulton did not announce names of other bidders or any figures connected with the bidding.

G. S. Hinsdale of Portland, Dawn president, said the firm is continuing to negotiate with AEC on a contract for building and operating the processing plant.

At the same time, a Spokane consulting firm said that a new field is opening in the Spokane area for preliminary processing to upgrade uranium ore. No names were disclosed, but the firm said a Texas interest planned to begin operating a portable upgrading plant in the Spokane area no later than Nov. 1. Plant reportedly uses a dry process and can be moved on three trucks and trailers.

The plant would be operated as a joint enterprise with Spokane area capital to test low-grade uranium ores in northern Idaho, and Pend Oreille, Stevens, Ferry and Spokane counties of Washington.

Daybreak Uranium, Inc., officials confirmed that their company had been approached on the possibility of a preliminary processing plant to improve the grade of ores, but said no final arrangements had been made.

Big Smoke Uranium, Inc., is drilling on a two-shift basis on its properties on the Spokane Indian Reservation. William O. Kumbera, president, said that 10 widely scattered percussion holes have been completed and the results are favorable. Drills have gone through several zones of good radioactivity and have located what may be the same granite-argillite contact zone in which Daybreak Uranium, Inc., found uranium in the adjacent Lowley lease on the reservation. Big Smoke is drilling both north and east of the Daybreak location.

North Star Uranium, Inc., has contracted with Daybreak Uranium, Inc., to operate the 160-acre Kessler-McChesney lease east of Daybreak's Dahl property on Mount Spokane. Under terms of the contract, North Star began exploration early in August, and will receive 60% of the net profit after payment of exploration costs. Kae H. Sowers, Daybreak secretary-treasurer, said the contract would allow development work on the property to begin immediately, rather than delay-

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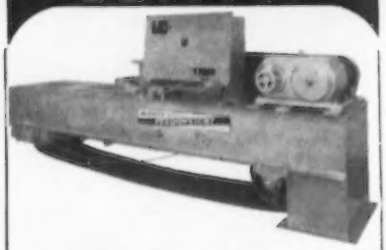

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CHAIRMEN FOR AMC CONVENTION, to be held October 1-5 in Los Anegles, Calif., include Walter C. Lawson, left, chairman of the program committee for the meeting, and Guy V. Woody, chairman of manufacturers division. See p 106

Washington *(Continued)*

ing until Daybreak's own crews can complete work on other properties.

Dawn Mining Co. has awarded a contract to Isbell Construction Co., Reno, Nevada, for stripping the surface of uranium-bearing hill No. 1 and the 459-acre Boyd tract on the Spokane Indian Reservation. Boyd unit No. 1 is believed to contain an extension of the Midnite vein, which Dawn is developing on an adjoining tract under lease with the locators of Midnite Mine.

Bunker Hill Co., San Francisco, which has owned a controlling interest in Northwest Lead Co., Seattle since 1931, has acquired complete ownership, according to Roger H. Cutting, president of Northwest Lead.

The Seattle company will become the sales and fabrication division of Bunker Hill Co. with Cutting as division manager. Cutting will move to the parent firm's head office in San Francisco.

The high-silica Lyons Hill sandstone deposit near Springdale is now producing pit run material for shipment to the Carborundum Co. at Vancouver, Wash. Property is leased to Exploration & Development Associates of Los Altos, Calif., with Ott F. Heizer as general manager. The Del Monte Properties Co., one of the largest silica sand producers in California with properties and plant near Monterey, is now investigating the idea of constructing a plant in the Northwest to produce finished sand products to the glass, foundry, and silicon carbide industries following procurement of an option on the property from Exploration & Development Associates.

WYOMING

Continental Uranium, Inc., with field headquarters in Grand Junction, Colo., announced in July an agreement with Gaddis Mining Co. under which Continental will purchase the Gaddis uranium properties in the Crooks Gap area of Wyoming. Robert Pruess, Continental general manager, said the transaction will involve $3,225,000 in cash and stock, with payments spread over a six-year period.

Continental uranium shipments now approximate 7,000 tons monthly, Pruess said, and will increase as full production is achieved from the company's Rattlesnake open pit operation near La Sal, Utah. Rattlesnake shipments were expected to reach 1,000 tons monthly in August, and 4,000 tons or more by December.

Phelps-Dodge Corp. reportedly has hit commercial grade uranium ore in four out of an initial six holes drilled on properties of Wyoming Uranium Corp. in Crooks Gap District, Fremont County, Wyo.

Wyoming Uranium officials said the six holes drilled—a span of 32,000 ft—had nearest ore discovery 600 ft from the Shinkalobwe ore body discovered some months ago by Wyoming. It has not yet been determined definitely whether this discovery represents an extension of the Shinkalobwe.

At Bisbee, Ariz, P-D officials said only that radiation had been encountered and that no results on assays had been obtained in proof of the Wyoming Uranium Co. report.

Officials of the Wyoming Mining Assn. have protested decision to close the Riverton, Wyo. buying and sampler station upon completion of construction of two mills in Fremont County.

AEC is currently completing contracts with Utah Construction Co. and Lucky Mc Uranium Corp. for a mill serving the Gas Hills District and with Lost Creek Oil and Uranium Corp. for a concentrator in the Crooks Gap district.

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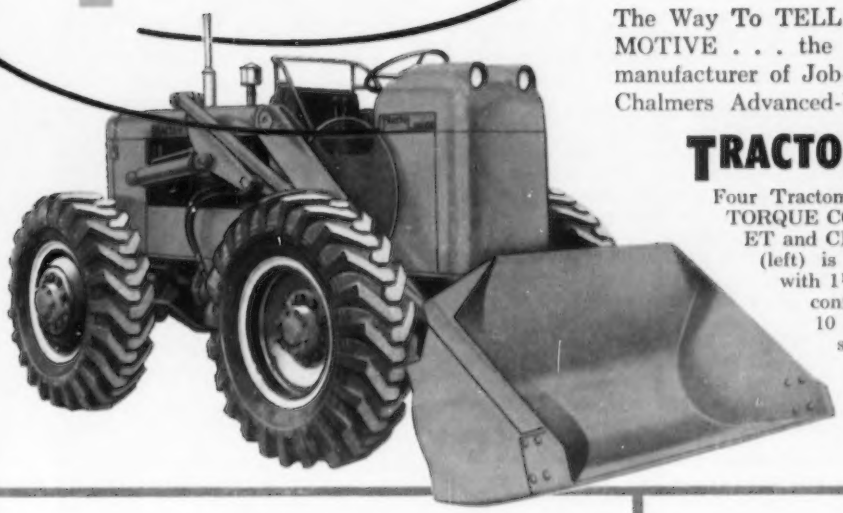

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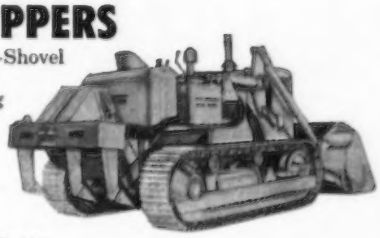

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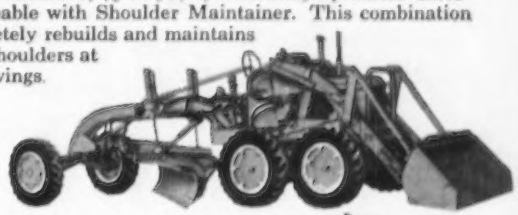

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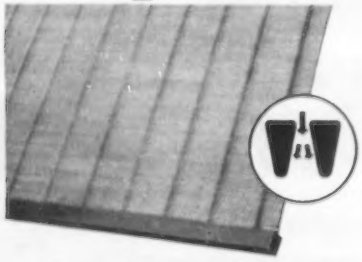

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Gas Street at Nickle Plate R. R.
Wellington, Ohio

Wyoming *(Continued)*

Grand Junction Operations Office, assured Wyoming uranium producers July 17 that no drastic cuts are planned in purchases at the Riverton ore buying station until "another market is provided." Jones' statement indicated quotas at the buying station will not be changed until proposed mills in the Gas Hills and at Split Rock are in operation.

Lost Creek Oil and Uranium Co. hoped to begin receiving ore by Aug. 15 at the site of its proposed $3-million uranium ore processing mill in Fremont County. Mill, one of two proposed in Fremont County, will be built near Split Rock, about 25 miles south of the Gas Hills area and 10 miles north of Crooks Gap, two of the largest uranium producing areas in Wyoming. Contract was signed Aug. 10.

President Robert Adams said construction would be started in August on a scale house and a sample building at the mill site. Mill will be capable of processing 400 tpd of uranium ore.

First shipment of uranium ore from a new mining area near Findley Springs, east of Sand Draw in booming Fremont County, has arrived at AEC buying station in Riverton.

The 20-ton shipment came from the Hades claim group, operated jointly by Rex Peters and Dick Koenig. The ore is a rich yellow carnotite in a dark, fine-grained sandstone.

Property from which the shipment was made is part of 39 Hades and 5 Arrow claims, lying east of Findley Springs, both below and above Beaver rim.

IN CANADA

ONTARIO

Greyhawk Uranium Mines has received a letter of intent from Eldorado Mining and Refining for purchase of $17,850,000 worth of uranium precipitates. A treatment plant of 600 tpd capacity is planned with production expected to start about October 1957. Shaft at the property in the Bancroft area is being deepened to 500 ft to establish three new levels at 200, 325, and 450 ft.

Maybrun Mines is considering a concentrating plant with rated capacity of 700-1,000 tpd at its copper-gold property in the Kenora area. In the meantime, exploration and underground development are being continued. A stepped-up drill program is also under way.

A letter of intent covering purchase of $72,981,000 worth of uranium precipitates has been received by Stanleigh Uranium Mining Corp. from Eldorado Mining and Refining, the government purchasing agent. Company previously reported that it was planning production at a rate of 3,000 tpd at its uranium property in the Blind River area. Recent diamond drilling has expanded ore tonnage potential, present estimate being 8-million tons.

Northspan Uranium Mines has received a letter of intent from Eldorado Mining and Refining Ltd. for purchase of $242,-416,800 worth of uranium precipitates, the world's largest dollar value for a single company. The operation also calls for the largest milling capacity of any company to produce uranium, 9,000 tpd. Production is expected to start within 12-15 months. Company's mines are located in the Blind River area. Management control is held by Rio Tinto Mining Co. of Canada.

Grade and ore widths at the copper prospect of Coppercorp in the Sault Ste Marie area are proving better than drilling indicated. On the first two levels, drifting has opened 1145 ft of ore with grade approximately 1.98% copper across 8.5 ft. Drilling in this area indicated grade of 1.71% across 6.0 ft. Only a small portion of the known ore zones has been opened.

Dyno Mines has received the second largest purchase order for uranium to be awarded in the Bancroft area. A letter of intent for $31.7-million worth of uranium precipitates has been received from Eldorado Mining and Refining. Currently preparations are going forward for the construction of a 1,000-tpd mill. Plans are to have the mill in operation by July 1957. A 3-compartment shaft is being sunk to 970 ft to provide six levels, three levels of which will be developed immediately.

Caland Ore Co. has commenced preparations for the sinking of a 5-compartment shaft at its Steep Rock iron property. The shaft is to go to an initial depth of 1300 ft with hoisting capacity of some 1.5-million tons annually planned. A second production shaft is also to be put down at a later date. Initial production will be from open pit operations. Shipments are to start in 1960 at a rate of 1.5-million tons annually and are to be worked up to 3-million tons by 1969.

Noranda Mines and Prospectors Airways have started work on a new copper discovery recently acquired jointly at McInnes Lake, 12 miles southwest of Coldstream Copper Mines. Copper mineralization of ore grade has been found at a number of points in a zone which has been estimated to be at least 1500 ft long and 100 ft or so wide. The discovery has resulted in rather heavy staking in the area.

A letter of intent covering purchase of $77,925,000 worth of uranium precipitates has been received by Milliken Lake Uranium Mines from Eldorado Mining and Refining. The contract is the third largest in the Blind River area. Work is being pushed at a rapid pace to bring the property into production at a rate of 3,000 tpd. Two shafts are currently being sunk.

Coldstream Copper Mines is preparing its copper property in the Shebandowan area, about 70 miles west of Fort Wil-

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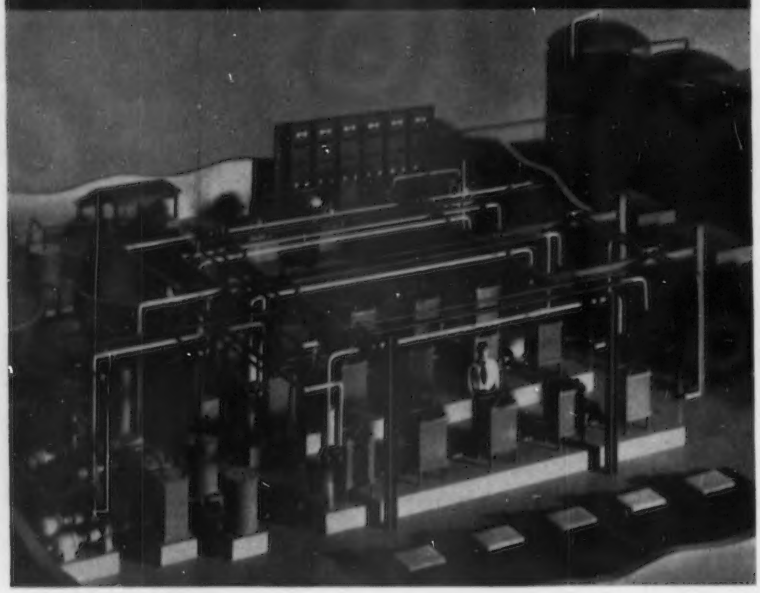

Fifteen months ago, an IONICS electric membrane plant began supplying part of the fresh water required for a drilling and refining community of 5000 people on oil-rich Bahrain Island in the Persian Gulf.

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The expanded plant, shown in this model, is now under construction with special allowance for future increases in capacity.

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Well water chemical analysis . . . . . 3100 ppm dissolved solids
Product water chemical analysis . . . . . 450 ppm
Electric energy consumption . . . . . 15 kwh per 1000 gallons
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Ontario *(Continued)*

liam, for production at a minimum rate of 1,000 tons daily by September, next year. Four levels have been opened with detailed development on the first two outlining approximately 2,500 tons per vertical foot averaging 2% copper. Work is progressing on the third level with plans for opening of two additional levels at 775 and 925 ft.

NEW BRUNSWICK

Billiton Co., Dutch mining and smelting organization, has let a contract for the sinking of a 3-compartment shaft on its property, 12 miles north of Bathurst. Shaft is to go to 460 ft with three levels. Lateral work is to be done on the 175-ft and 425-ft levels initially. Diamond drilling has outlined an orebody at least 3400 ft long and 6.5 ft wide with estimated average of 0.5% copper, 4.0% lead, 3.5% zinc, and 6.0 oz silver. Deepest hole cut ore at vertical depth of 1350 ft.

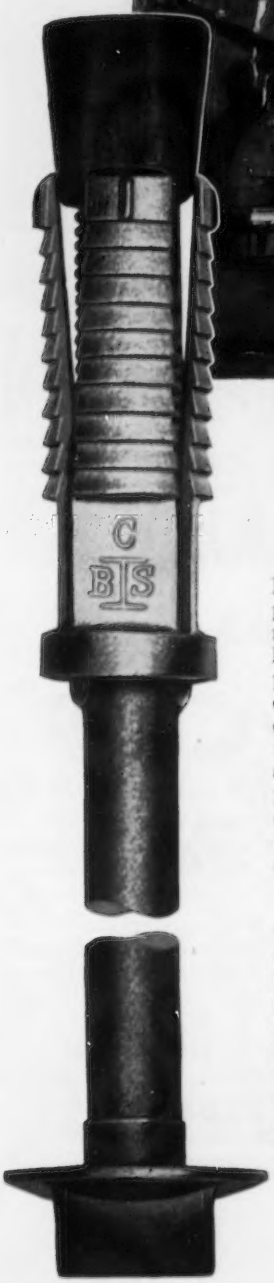
QUEBEC

Chibougamau Jaculet has discovered a third copper ore zone in drilling on its Chibougamau area property. First results indicate higher values than those obtained in either the No. 1 or 2 zones. Three drills are now in operation to test length and depth of the new zone. Thirteen drills are also in operation to fill in gaps on the No. 1 and 2 zones in preparation for underground work. The No. 1 zone has been proved for a length of 2200 ft with drill indicated tonnage of about 1,650 tons per vertical ft, and the No. 2 zone for 1300 ft with indicated tonnage of 2,600 tons per vertical ft. Indicated average grade is estimated at about 2.3% copper.

Underground operations are to get under way at the Barvue Mines property in the Barraute area. Early August the spiral tunnel was about two-thirds completed and some ore is being drawn from the upper portions of the tunnel. Tonnage treated will be reduced from current rate of about 4,800 tpd to between 3,000-3,200 tons of zinc ore.

Bateman Bay Mining is carrying out an extensive diamond drilling program on its 18-claim property at Chibougamau. A copper zone, which has been indicated for a length of 400 ft with both ends open, is being tested by three diamond drill rigs. Two other zones have also been indicated and are slated for further investigation.

Quebec Chibougamau Goldfields has located a new copper-gold vein in shaft sinking on its property in the Chibougamau area. Vein is located 150 ft from the footwall of the ore zone. Assays have run as high as 0.46 oz gold, 1.32 oz silver and 1.85% copper. Previous drilling indicated 1-million tons of good grade copper ore to depth of 700 ft.



This Headed Roof Bolt helps prevent roof falls

Roof falls, resulting in injury and loss of production, are less likely when you use roof bolting, with Bethlehem's square-head roof bolt. This method of roof support promotes safety because it anchors overlying rock. What's more, roof bolting offers these other worthwhile advantages: (1) improved ventilation, due to the absence of bulky supports, (2) increased production through greater freedom in operating mechanized equipment, and (3) less need for storage space, both above and below ground.

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The Bethlehem square-head roof bolt owes its positive locking action to the leaf-type malleable-iron shell with which it is used. When the bolt is tightened, the leaves of the shell expand, providing a firm four-way grip against the sides of the hole. A square roof plate provides additional support. A hardened washer, furnished with the assembly, reduces friction between the bolt head and roof-plate.

Bethlehem also manufactures a 1-in.-diam slotted roof bolt, used with a steel wedge. This bolt, because of its larger diameter, is ideal where maximum strength is required. It is also suitable for pillar bolting. When installed, the wedge is driven into the 6-in. forged slot, spreading the bolt-ends to fill the hole.

If you would like to consider a roof-bolting program, we suggest you would find it worthwhile to talk with a Bethlehem representative. Just get in touch with our nearest sales office.

TYPE	DIAM	TYPICAL BREAK LOAD, LB
Carbon	¾ in.	24,000
High-Strength	⅝ in.	24,000
High-Strength	⅞ in.	45,000

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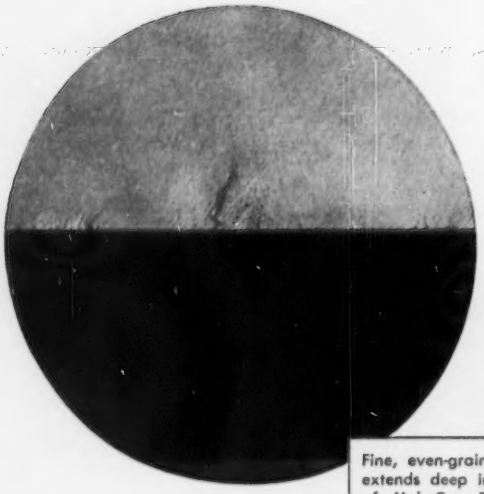

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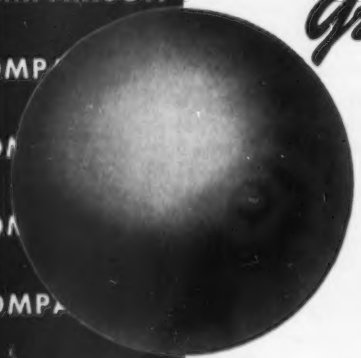

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THESE bottom-heavy bags of plastic material are being flattened, for storage and palletizing for shipment, by a Carrier Natural-Frequency Conveyor...

They used to be flattened manually, one at a time, by two men who literally patted them into shape. It was a slow, expensive operation. And unfortunately, conventional bag flatteners couldn't do the job satisfactorily because the product was too light and fluffy.

The solution called for imagination and Carrier engineers were quick to supply it. They soon designed a Natural-Frequency Vibrating Conveyor that did the trick perfectly. It's a 9' conveyor that gently tosses the bags along a slight uphill grade. When the bags come off, they are so flat that *15% more of them can now be put in a freight car.* The whole operation has also been speeded up, and labor costs substantially reduced.*

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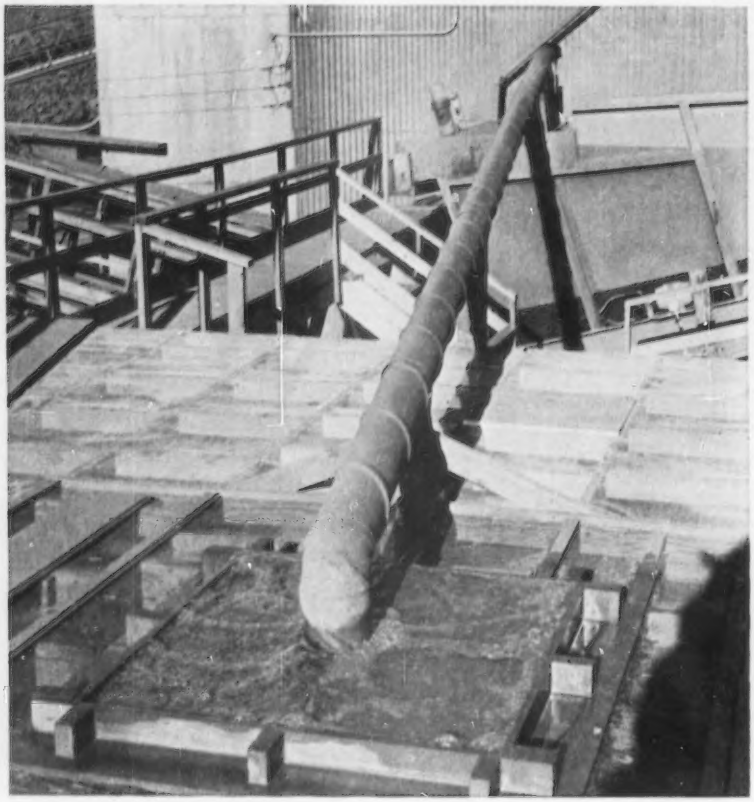
About NAYLOR *Performance*



The familiar Naylor spiral brings the outstanding performance of this light-weight pipe right out into the open — for water, air, tailings and ventilating lines in mining service.

It's no secret that Naylor's exclusive lockseamed, spiral-welded structure means extra strength and safety. The spiral truss acts as a continuous expansion joint to absorb shockloads, stresses and strains. In addition, it provides greater collapse strength for push-pull ventilation and other applications normally requiring heavier-wall pipe.

For all-around service in the mining field, you can depend on Naylor pipe, in diameters from 4" to 30", to get the economy of light weight without sacrifice of performance.

Write for Bulletin No. 507.

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Quebec *(Continued)*

A 3-compartment shaft is now being sunk to depth of 1,000 ft with levels to be opened at 150-ft levels.

Mogul Mining Corp. is preparing its Harvey Hill copper mine for production. Property is located in Leeds Twp, 12 miles north of Thetford Mines. It is proposed to start production at an initial rate of 600 tpd with provision for expansion to 750-800 tons. Mill site has been prepared and a new internal 3-compartment shaft is to be sunk to open two new levels below the existing adit level. Work to date has indicated an estimated 770,000 tons averaging 1.85% copper plus some silver.

LeMoyne Ungava Mines is currently carrying out an exploration program on its two groups of claims in the Ungava area. Company holds exclusive prospecting rights for three years on a 350-sq-mile area in the Cape Smith region. American Smelting & Refining Co. has taken a 30% interest in the 2-year $200,000 exploration program planned by LeMoyne.

A new company, Columbium Mining Products Ltd, has been formed to take over operation of the jointly held Oka property of Coulee Lead and Zinc Mines and Headway Red Lake Gold Mines. Two drills are currently in operation in an area, where to date some 30-million tons grading 7.0 lb columbium pentoxide per ton have been indicated. Further exploration and development are planned.

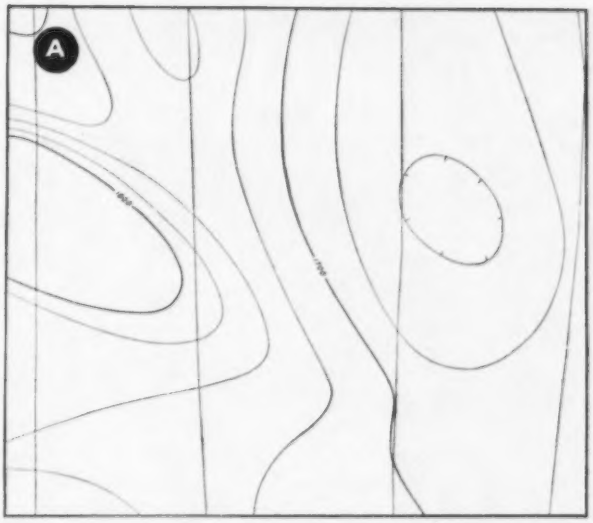
A staking rush has developed in an entirely new section of the Opemiska-Chibougamau district, along a mineralized belt stretching across four townships. New Jersey Zinc Exploration Co. (Canada), a wholly-owned subsidiary of New Jersey Zinc Co. of New York, is reported to hold claims for eight miles along strike in the centre of the belt and additional property on strike to the west of this group. Other companies in the area include Tomiska Copper, Anglo-American Copper Corp., Dominion Asbestos Mines, Empire Oils and Minerals, and Lenwood Mines. Several other companies are negotiating for property.

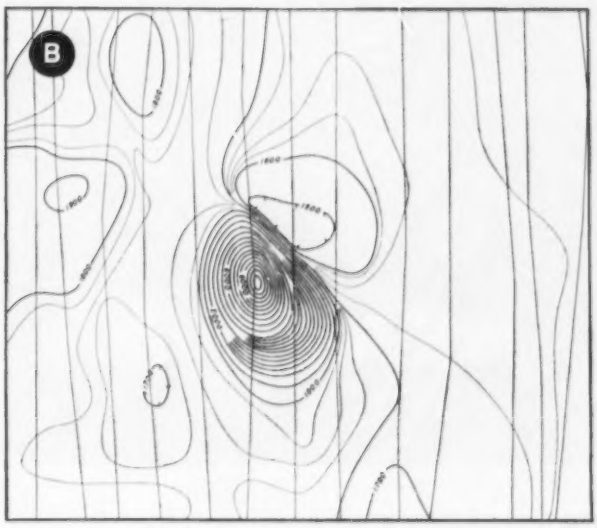
Diamond drilling on the 1,600-acre copper property of Ungava Copper Corp. about 50 miles west of Fort Chimo, has expanded indicated ore to an estimated 4-million tons. Grade is expected to average out around the original estimate for 2.5-million tons of 1.12% copper, 1.59% zinc, 0.04 oz gold with silver values. Drilling is being continued.

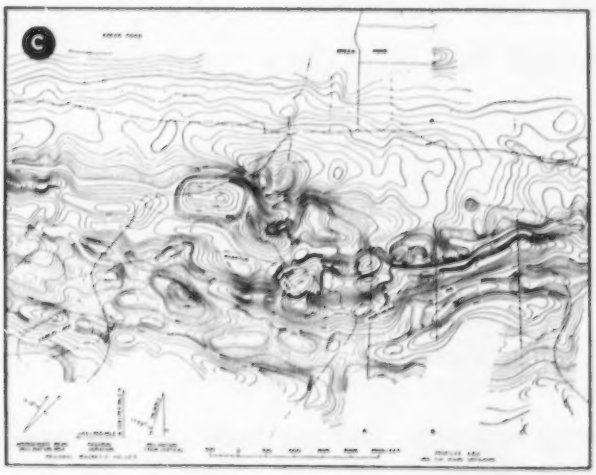
MANITOBA

Details of International Nickel Co.'s project in northern Manitoba have been obtained from Manitoba government sources.

INCO first began exploration in the Mystery Lake-Moak Lake area about 10 years ago, when a small outcropping of nickel ore was discovered at Mystery







NEW DATA TO AID YOUR EXPLORATION PLANNING

...on line spacing effect

...on helicopter surveys

Important New Facts Concerning Airborne Surveys Developed by These New Studies

A detailed study of the Marmora, Ontario magnetic anomaly shows the effect of line spacing on the air-mapped anomaly. Map A shows the anomaly defined by one mile spacing. Map B shows ¼ mile spacing, indicating that even so large and intense an anomaly as the one associated with Marmora can be missed by inappropriate line spacing. The complete story, which includes other illustrations and determinations of optimum spacing, may be obtained from us.

Another study by us compares the results of a low level survey by helicopter with a dip needle survey, and other maps of the Green Pond area in New Jersey. Map C presents data from the helicopter-borne magnetometer survey, flown 100 ft. above the terrain with a 200 ft. flight line spacing. Other data on costs, accuracies, other factors, are included in the report.

If you'd like to have a copy of the Marmora or Green Pond reports, write us today.

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Single Conductor—Reel cable made extra flexible and tough, Hex-Tite assembly to withstand re-reeling, rubbing and scraping.

Two-Conductor Round, Type G—Cable with two ground wires and two insulated conductors possesses maximum flexibility.

Three-Conductor Type W—Cable with three insulated conductors is available with heat-resistant insulations for either low or high voltages.

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When you need a cable with unique specifications, consult with Okonite and avoid the costly troubles that often result from makeshift solutions. Special constructions are available for the newest mining equipment, including all types of continuous miners. Here are examples of the many Okocord special constructions that are manufactured to the same rigid specifications as standard constructions.

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Four-Conductor Type PG—Special cable for d-c systems is similar to three-conductor type except with 3 insulated conductors.

Five-Conductor Type PCG—Special cable for "permissible" equipment features 1 uninsulated grounding, 2 insulated control and 2 insulated power conductors.

Six-Conductor Type PCG—Special cable for a-c systems is similar to five-conductor type except with 3 insulated conductors.

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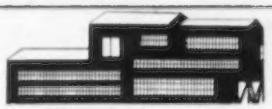

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. . . Okocord Mine Drill and Control Cord, Okocord Type SO, Parkway, Okonite Mine Power Cable, Okocord Twin Type W . . .

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4184-A

Bulk Mineral Storage by the SAUERMAN Method

Reclaiming Triple Superphosphate to Hopper

Overall View of Storage

How Sauerman Scraper Storage Reduces Costs

200,000 tons of triple superphosphate are produced each year in this new Florida plant. It is delivered by overhead conveyor to a 329′ x 146′ storage building of 35,000 ton capacity. The material is then stockpiled and reclaimed by a 2½ cu. yd. Sauerman Scraper at a rate of 150 tph.

Here's how a Sauerman Machine cuts costs:

One operator, located in a safe station overseeing the entire area, can recover practically 100% of all stockpiled material.

All highly machined parts, hoists and motors can be located outside of the building and protected from corrosion and dust.

When parts are replaced—sheaves, clutch or brake linings—the machine is restored to practically new condition, even though it may be twenty or more years old.

Only the Crescent scraper and cables contact the material. The scraper machine can be designed to operate the scraper on top of non-caving material. This allows the scraper to break down any high faces that may be standing.

Sauerman Storage Machines are built for hourly capacities of from 20 to 600 cu. yds. A partial list of producers and manufacturers using some type of Sauerman equipment includes:

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Lion Oil Co.
Potash Company of America
Tennessee Farmers Cooperative
Virginia-Carolina Chemical Corp.
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Manitoba *(Continued)*

Lake. Since then richer deposits were discovered by geophysical survey methods at Moak Lake. The large body of low grade ore lies under Mystery Lake which would have to be drained if this was to be developed. The Moak Lake deposits can be worked without draining the lake.

From these lakes "teaser" occurrences run out for 40 to 50 miles, indicating there may be gigantic deposits still to be discovered. Exploration is now going on at the 700-ft and 1300-ft levels in an exploratory shaft at Moak Lake. This shaft cannot be used as a mine shaft, but will speed the work of sinking main shafts if the mine is developed.

At present INCO reportedly did not have enough workable tonnage to support a mine, but it was expected that enough might be available by the end of September.

The nickel ore in the area contains small amounts of copper, which would be a refining nuisance as it is not available in commercial quantities. There are also small quantities of platinum, paladium, gold and silver which would just pay for their own separation.

Negotiations with the Manitoba government centered on a natural dam at the future power plant which, while not rising the river level, would produce twice as much power as the nickel operation would need at first. It would be fully adequate for any future development.

Extra power could be obtained by raising the dam level, or by constructing additional dams on the river.

INCO plans indicate the possibility of a plant to produce fully finished electrolytic nickel at Moak Lake, but a partly refined intermediate product may be exported in the first stages. INCO officials are studying the possibility of shipping the nickel 300 miles up the Hudson Bay railway and out through the port of Churchill.

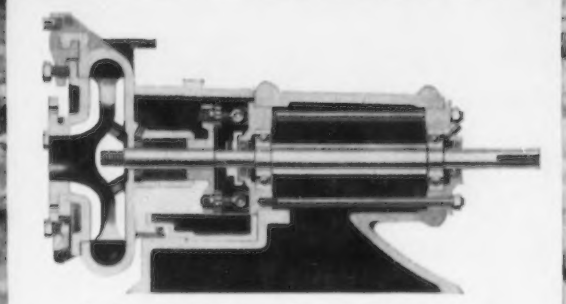
The Moak Lake ore runs about .6% nickel with lenses of much higher grade material. The big question is whether there is enough high-grade ore to "sweeten" the basic low grade deposits.

In the end everything will hinge on production cost. If the Moak Lake nickel cannot be developed cheaper than the Cuban product, the project will not be commercially feasible. One advantage for Moak Lake ore is that it can be cheaply concentrated, increasing the grade by four or five times, before the expensive smelting process begins. Cuban ore reportedly requires expensive treatment from the beginning.

Lithium Corporation of Canada, a subsidiary of the Mogul Corp., will ship 400 tons of barrelled lithium ore from southeastern Manitoba to Britain, where a new bleaching process is being tried out.

The ore will come from the Cat Lake-Bernic Lake area where an estimated 12-million tons of lithium ore are awaiting exploitation. A mill is to be started at the Cat Lake-site this fall, concurrent with the construction of a lithium plant

Handling TOUGH taconite tailings



Cutaway view of Amsco Pump used for pumping taconite tailings. All wetted parts are HC-250 Alloy.

AMSCO® HC-250 Alloy outlasts previous material 4 to 1

On the Iron Range at a Minnesota plant handling taconite tailings, a 6″ Amsco Pump was equipped with complete HC-250 water ends and HC-250 impeller.

In this highly abrasive pumping application, the HC-250 water ends have given over 4,500 wear-hours. The impeller is outlasting the previous alloy material 4 to 1.

HC-250 is a special, high-chromium alloy perfected for pump parts in operations where highly abrasive material is being moved. This alloy is not limited to purely abrasive problems; it also has excellent resistance to rust, corrosion and impact.

To get extra efficiency from your pumping operations, ask your Amsco Pump specialist for data on HC-250. He will analyze your requirements and recommend the type of Amsco Pump—and material for wear-parts—best suited for your application.

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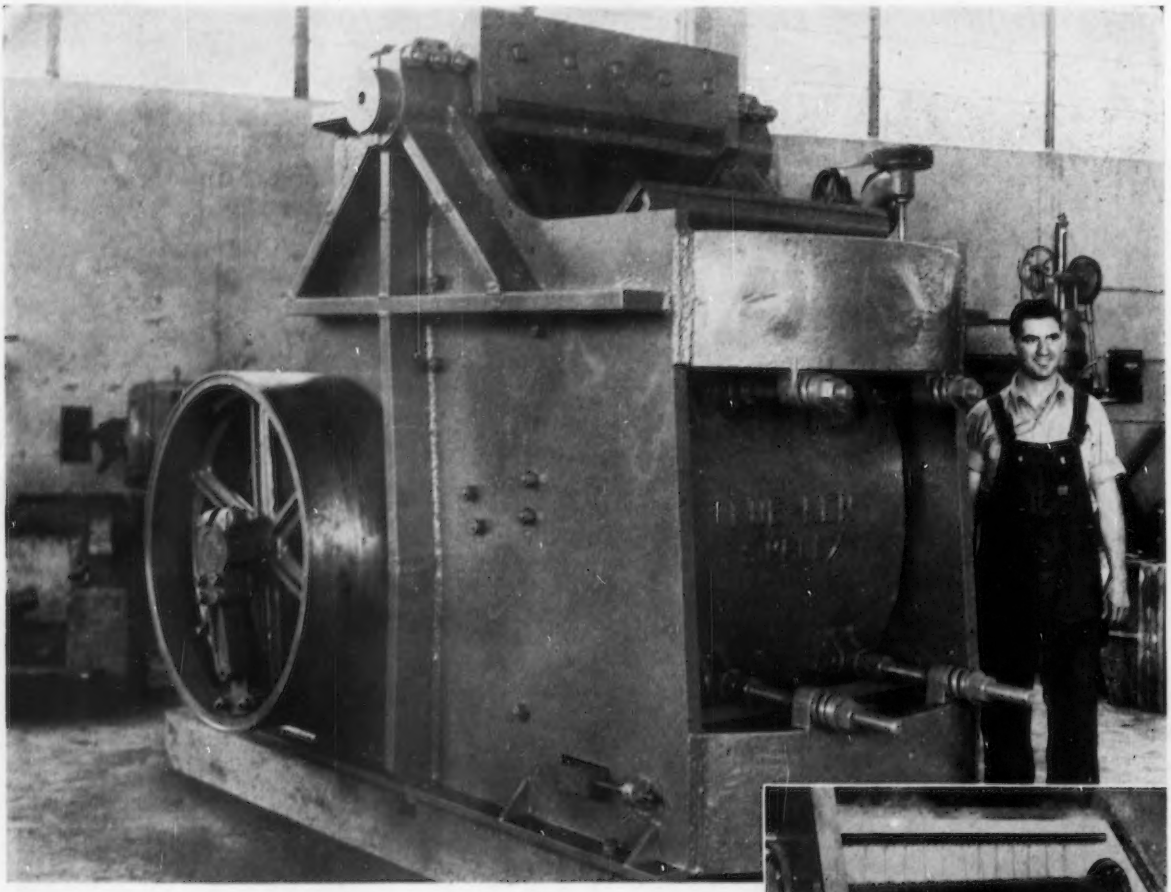

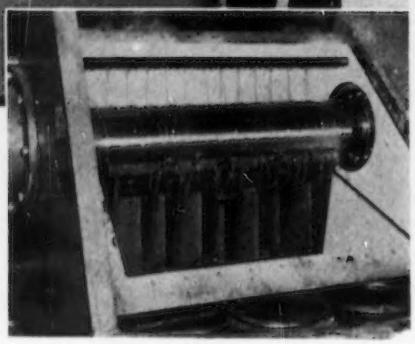

Kue-Ken® Crusher gives you the capacity you need yet costs you less!

High speed Kue-Ken has capacity comparable to other crushers of larger size. Often, this permits you to use a smaller size Kue-Ken than another larger, more costly crusher. This 42" x 27" model Kue-Ken produces 170 to 250 tons per hour and a more cubical product. Jaw plates outlast those of other crushers 5 to 10 times, power consumption is far less. Breakage from overload is eliminated by automatic flywheel release that is quickly reset.

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Kue-Ken toggles are machined, polished, flame hardened. They operate encased in a bath of filtered, dust-free oil that maintains their original micrometer tolerances for the life of the crusher. Photo shows Kue-Ken operating with cover removed to show filtered oil pouring over shaft, bearings and toggles.

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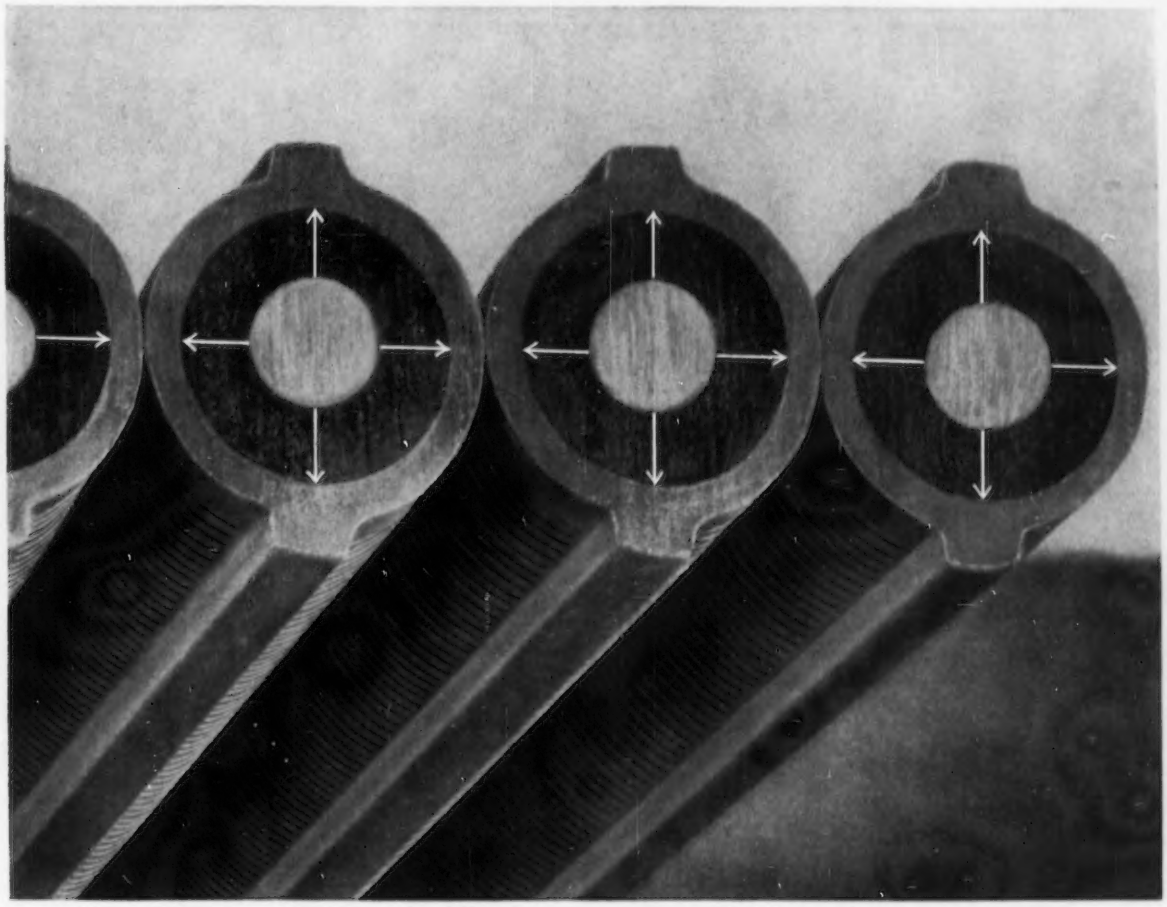
For all mining applications



Power tubes expand without shedding — preserve battery life

BATTERY FOR MINE LOCOMOTIVE. Exide-Ironclad Model MVM. Write for copy of Bulletin No. 5161.

Every time you discharge a storage battery, the active material on the positive plates expands. But the plate grids don't expand. This is basic.

On most batteries, the expanding active material tends to shear off from the nonexpanding grid every time the action takes place. But this can't happen in the Exide-Ironclad Battery. The reason is simple.

Active material is formed concentrically around the spinelike grid and held inside the plastic tubes. Expansion is predominantly in an outward direction—hence no shearing. Active material remains firmly locked to the underlying grid structure. And the flexible plastic tubes yield and take up as needed.

This extra protection against shedding of active material is only one of the many reasons for the long life of Exide-Ironclad Batteries. When you order heavy duty batteries, or the equipment requiring them, be sure to specify Exide-Ironclad. Write for detailed bulletin. Exide Industrial Division, The Electric Storage Battery Company, Philadelphia 2, Pa.

Exide®

LOADS SAFELY BOUND

Safety conscious contractors tie down their truck loads of construction material with Laughlin Load Binders! There's no chance for injury or loss because the smooth lever action takes up 4½-inches of chain—holds lumber, piles, pipe, sheet material positively—safely! This tough, drop forged and heat treated binder is the most versatile available—and it's made for the strongest chain! One Laughlin binder will handle four chain sizes! Merely switch Clevis Grab Hooks to fit the chain you're using! Keep Laughlin Clevis Grab Hooks on hand to fit your chains—then there'll be no delays!

100% HOLDING POWER

When genuine Crosby* Clips secure wire rope rigging and tackle, men and materials are 100% safe! Positive gripping power gives confidence to workers, and confidence means top working efficiency. High strength steel is formed into the world-famous "Red U-Bolt"*. High wings on the drop forged base hold the rope securely in place. Look for the "Red U-Bolt"! You'll see it used on ropes of all sizes, because only Crosby offers a complete range of sizes to fit ⅛" to 3" diameter ropes!

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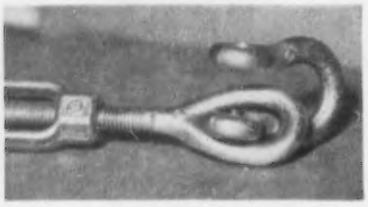

AN EYE FOR SAFETY!

. . . that's the eye design that was originated by Laughlin engineers. The ear of a shackle only one size smaller slips through the pear shaped eye—a design that conforms more closely to the line of pull—makes Laughlin Turnbuckles stronger and safer! Hex ends on the hefty body make take-up fast and easy. Weldless, hot galvanized turnbuckles, forged from special steel, are available from Crosby-Laughlin Distributors in a variety of end fittings and in sizes from ¼" x 4" to 2¾" x 24"!

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Manitoba (*Continued*)

somewhere in southern Manitoba.

This concentrate or processing plant will be located in an area that provides a satisfactory labor supply, and which will be near enough the new Trans-Canada Pipe Line. Natural gas, piped through the pipeline, will be used to produce lithium salts from the lithium oxide.

To date the Lithium Corp. has spent $1.2-million at the mine site, a further $3-million is to be spent this fall at the mine, and by next summer, with the completion of the processing plant, the company will have spent an estimated $5-million.

Lithium Corp. has another claim at Bernic Lake, 13 miles south of the Cat Lake site, containing 750,000 tons of high-grade ore. On that same lake Montgary Co. is drilling on a 5-million-ton orebody, and has optioned property in Winnipeg for a $3-million processing plant.

A few miles west of Cat Lake, the Violmac Co. is working on a 4-million-ton holding.

Lithium Corporation's mine on a single 1,500-by-1,500 foot claim with 1-million tons of blocked-out ore to the 600-ft level, will be almost unique in Canada. Only at Kirkland Lake, Ontario, are mines operating on single claims.

SASKATCHEWAN

Geological surveys in the Precambrian area of northern Saskatchewan are being continued this summer by the provincial Department of Mineral Resources. Two 5-man parties are undertaking routine mapping and outlining favorable prospecting areas, while three 2-man parties are investigating specific mineral occurrences.

One party is investigating copper occurrences in the Lac la Ronge area; another is examining iron deposits in the Black Birch-Frobisher Lake area, and a third is making geophysical and geochemical investigations in the Amisk Lake area near Flin Flon.

One of the larger parties is mapping the Manawan Lake area 90 miles northeast of Flin Flon, on a scale of 1 mile to 1 inch while the other 5-man party is working on geological mapping in the Wapus Bay area of Reindeer Lake.

BRITISH COLUMBIA

Spud Valley Gold Mines and Kenare Petroleum Corp. report high grade uranium occurrences at the Nic group in the Ingray Lake area, Marian River district, Northwest Territories.

The 21-claim group covers 1,100 acres of uranium-bearing ore and is owned by Kenare Petroleum, of Calgary, which is financing the exploration. Spud Valley is participating in the work and intensive drilling is under way.

Diamond drilling contract has been

JALTEN gives equal strength with lighter weight. Jalten steel plates go well with a weld.

Pre-heating is unnecessary with Jalten—even the weld is a factor in fatigue resistance

Low alloy, high strength Jalten offers good formability coupled with excellent corrosion and abrasion resistance

Jalten's high strength permits high design loads. It also permits a reduction in section when used to replace mild steels. Usually the reduction amounts to two gages affording a weight savings of approximately 25 per cent. Thus, dead weight can be eliminated—resulting in increased carrying capacity. Also, it is easily welded.

Jalten is furnished in four grades:

No. 1—possesses high strength, good formability and fabricating qualities—good resistance to low temperature impact.

No. 2—offers high strength, moderate formability—improved resistance to atmospheric corrosion.

No. 3—gives high strength—improved resistance to abrasion.

No. 4—provides superior formability and surface quality for bumper stock applications requiring plating.

Jalten Steels are available as sheets, strip, plates, structurals, bars and small shape sections.

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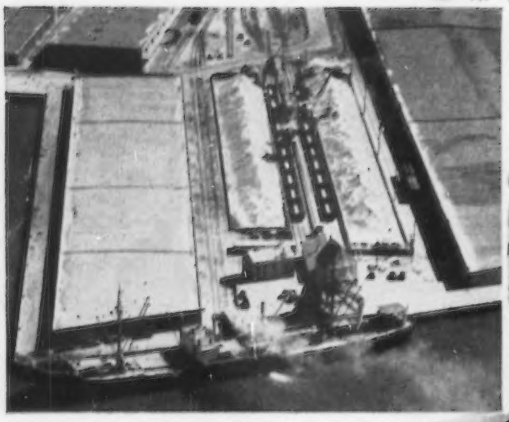

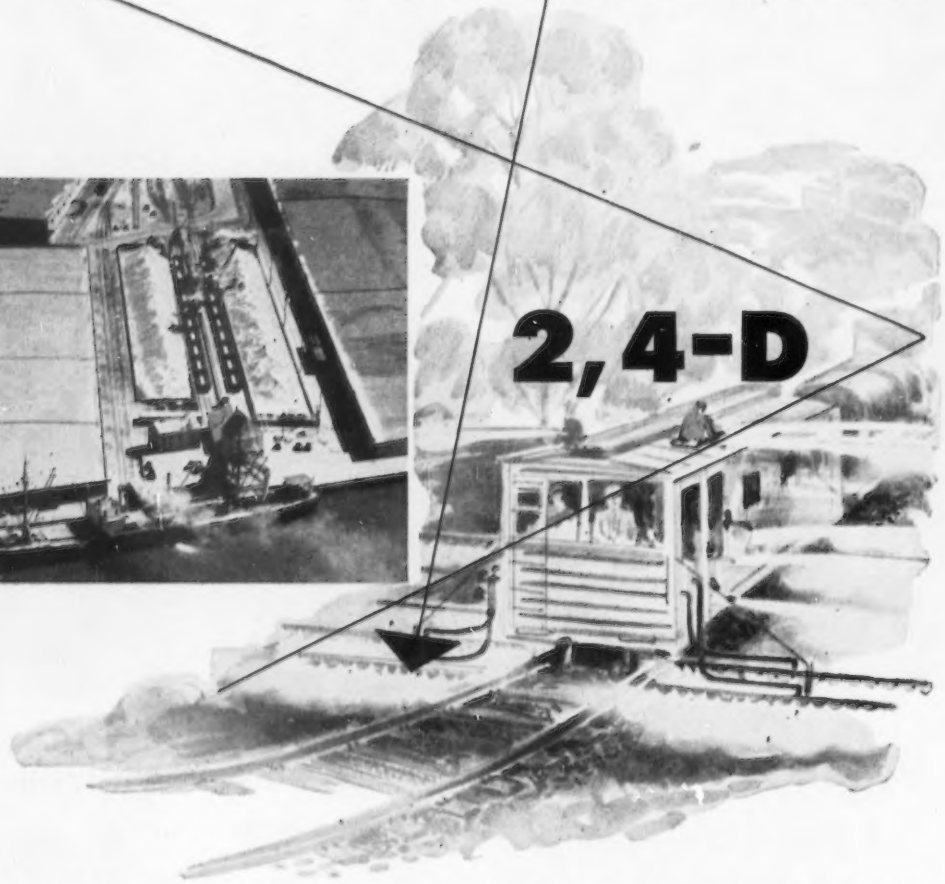

Naturalists have said that the forests would take over our cities in short order should all human activity cease. Railroads see vivid evidence of this on a small scale. They're constantly battling weeds on rights-of-way, on sidings, on spur lines.

Today, the battle is being fought more successfully than ever before with a new and powerful broadleaf weed killer 2, 4-D. And this chemical is proving useful, too, in suburban areas.

Where does Sulphur fit into the picture? It takes Sulphur to make sulphuric acid. It takes sulphuric acid to make phenol. It takes phenol to make 2, 4-D.

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When you have inspected the super-capacity LRVSW, let us give you the facts on Mack's complete line of off-highway vehicles . . . the largest selection in the industry. You'll find a heavy hauler to suit every large earth-moving job . . . a hauler that will give you top performance, outstanding economy, maximum dependability — qualities that have made Mack the acknowledged heavy-duty truck leader of the industry.

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British Columbia *(Continued)*

signed with Boyles Brothers.

A 200-ton mill has been recommended for Allied Mines' property on the Adams Lake crown granted claims.

Consulting geologist Dr. W. H. Patmore made the recommendation in his report on the property situated in the Kamloops area. Claims are known as the Homestake, Maple Leaf, Troublesome, Argentum and Silver Star, and a work program is underway.

Estimated ore reserves on the parent property represent a five-year supply blocked out, and about 3,000 tons ground barite on hand. The claims are reported in a highly mineralized area and yield uranium, silver, lead, zinc, copper, gold and barite, all of high grade.

The property is easily accessible, lying only 500 ft vertically above the Louis Creek road, 19 miles out to the Kamloops-Clearwater highway.

Ore can be developed easily by short 400 ft adits and a cheap mine road.

Granby Consolidated Mining, Smelting and Power Co. has already stated the July price drop has forced curtailment of exploration work at its Copper Mountain property near Princeton.

Following announcement by major U.S. producers of cuts of 6¢ a 16, the industrial copper price in Vancouver dropped 5½¢.

The price drop was termed the "inevitable result" of the "false levels" at which the red metal has been selling since last September.

However, industry spokesmen are confident that no disaster is in the offing: "We'll get worried when the price dips below that 30¢ mark."

Granby operation curtailment is explained by president L. T. Postle in a report of the company's first six months operation this year.

"Unless there is an immediate and substantial price improvement the possibilities of continuing a profitable operation at Copper Mountain are remote," Postle said.

Granby has been conducting a search for new ore recently as the developed ore reserves at Copper Mountain, one of B.C.'s major copper producers were rapidly being exhausted.

In recent weeks the central section of the province has stepped briskly into the mining picture:

(1) Heavy nickel staking activity is reported from Williams Lake area, and substantial copper staking near Prince George.

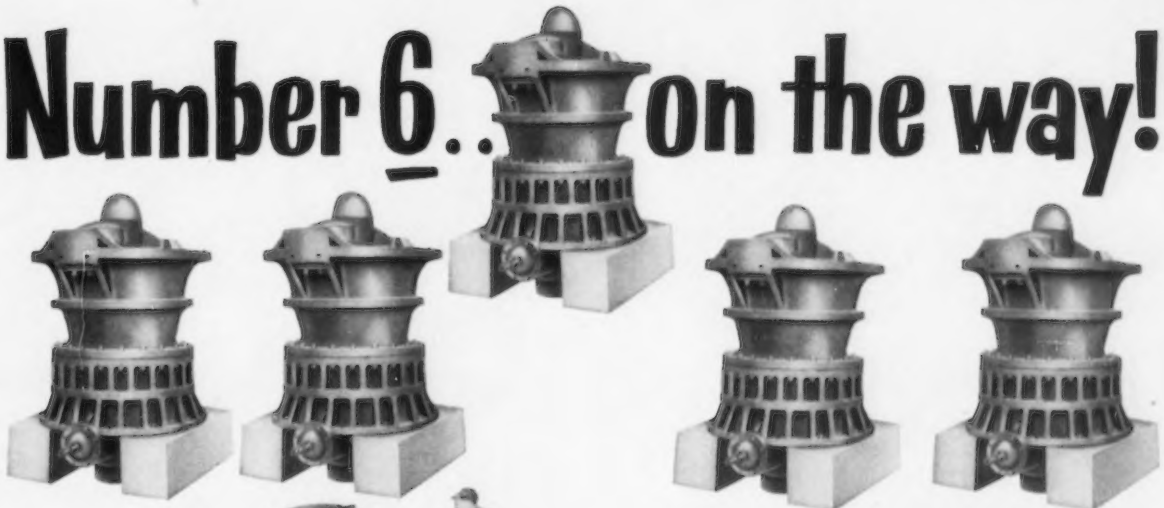
Chromite occurrence with "definite economic possibilities" is to be explored north of Ashcroft, and a base metals producer near Smithers may be put into production again.

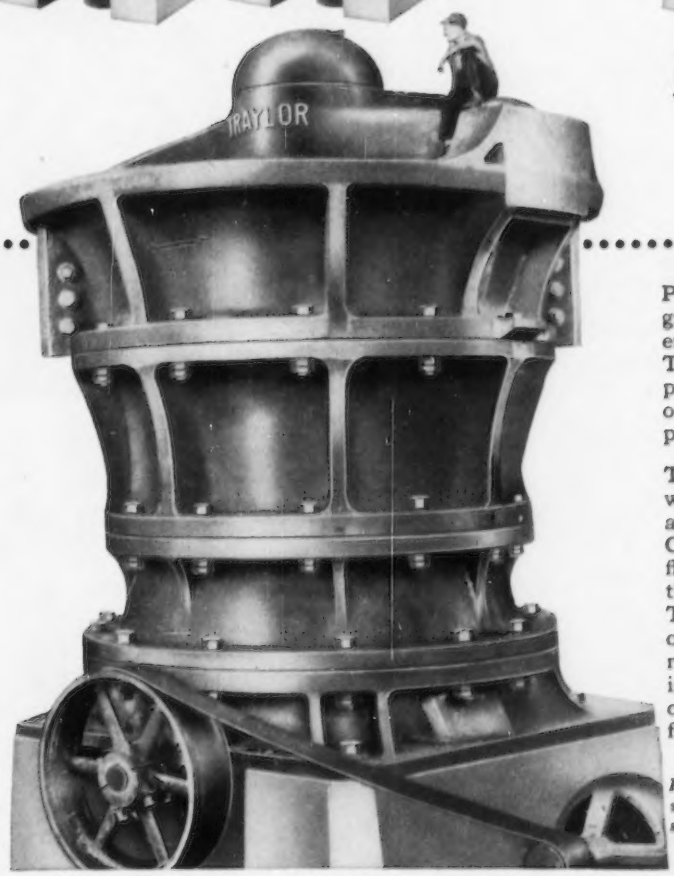
At Williams Lake major mining companies with options on recently staked nickel claims are bringing in diamond drills to prove up the properties.

Major claims are divided into three groups, the N.I. group, optioned by Granby Consolidated, the Trixie and

SHOVEL CABLE

Number 6... on the way!





Another Traylor TC Gyratory is added to the 5 on order for Big Taconite Project

Profitable production of iron ore from low-grade Taconite calls for the most modern, efficient methods and equipment. That's why Traylor Gyratories were the choice for both primary *and* secondary reduction at one of the extremely hard Taconite-bearing ore properties.

The initial order included a Gyratory Crusher with 60″ receiving opening and 102″ diameter crushing head, this huge TC Primary Crusher takes chunks of ore the size of a flat-top desk and reduces them to 12″ at the rate of 4,000 long tons an hour. Four Traylor 36″ Gyratories were included on the original order . . . to take the 12″ ore and reduce it to minus 5″ in the secondary crushing operation. Now . . . we've received an order for another 36″ Gyratory to join the five now being built.

For complete specifications and description of the outstanding features of Traylor TC Gyratory Crushers, send for your copy of Traylor Bulletin #126.

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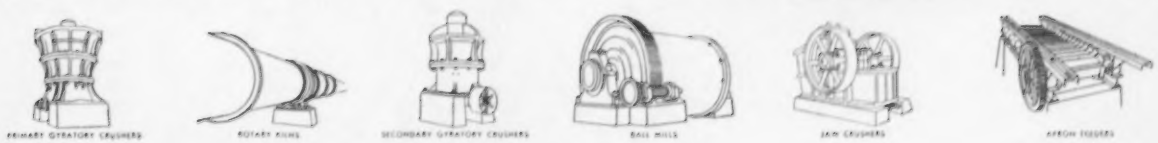

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If you were a cable manufacturer as well as a miner, you could use your mine experience to build cable better than others.

But since you aren't, it will pay you to buy your cable from Anaconda—who *is* both cable manufacturer *and miner.*

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Years of mine experience . . . of cable testing and improving . . . have taught us how to make a cable that *stays on the job longer under all conditions.* It's Securityflex* Type SH-D cable.

New, job-tested, high-grade butyl insulation assures better resistance to heat, water and compression. And new neoprene jacket makes this cable even tougher and more abrasion-resistant.

For Type SH-D, *or other shovel cable,* let Anaconda mine and cable experience pay off for you. See your Anaconda Distributor. Anaconda Wire & Cable Company, 25 Broadway, New York 4, N. Y. 66821

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Securityflex* Types W and G are used with small shovels, self-propelled drill trucks, pumps and a-c mining equipment. For higher voltages, Type SH cables (shielded) are recommended.

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Unexcelled for strength, wear resistance and long life. Type SO (heavy-duty) provides superior service on remote control and hand drills.

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It's no joke when you pick the wrong battery. The lucky fellows are those that have standardized on GOULD. They not only have the satisfaction of knowing they've got advance-design, research-built batteries that will do more and last longer . . . they have the finest field engineering service in the industry to help keep these batteries in top condition throughout their greatly extended service life. Every Gould battery is proven in Gould's own pilot plant before it ever goes into production. That's why you can be sure of getting more power per dollar—with Gould!

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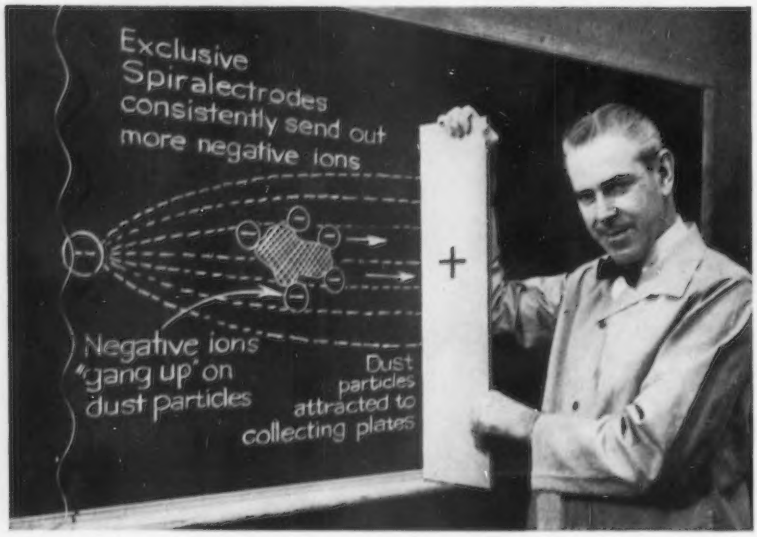
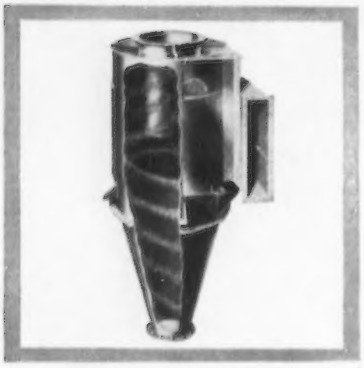
How a Buell Collection System "gangs-up" on dust to meet the toughest air pollution codes

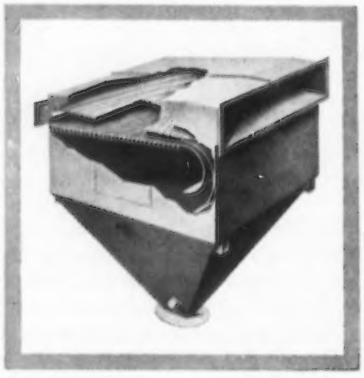




With positive gas flow control for peak efficiency . . . plus continuous cycle rapping to completely eliminate puffing . . . Buell's "SF" Electric Precipitator "gangs-up" on dust (even dust with high resistivity) to permit full production even under the most rigid anti-air-pollution codes.

Buell Cyclones also deliver extra collection efficiency to "gang-up" on dust: Exclusive Shave-off design harnesses double-eddy current and really puts it to work.

Buell's Low Resistance Fly Ash Collector combines high efficiency to meet present day strictness, with low draft loss for natural or mechanical draft installations.



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Experts at delivering Extra Efficiency in
DUST COLLECTION SYSTEMS

British Columbia *(Continued)*

Haddock groups, optioned by Copper Ridge Mining Company of Vancouver.

Both sides of the lake were staked solidly once the news of the activity leaked out.

At Prince George, more than 51 claims with rich copper values have been staked 10 miles west of the city.

Prospectors applications from Prince George, Dome Creek and Williams Lake have flooded the office of the government agent and mining recorder at Quesnel.

(2) **Western Chrome Mining Co.** plans a program of geophysical surveying and mapping followed by diamond drilling on its properties near Ashcroft.

C. H. MacDonald reports further investigations are warranted as the chromite occurrence has very definite economic possibilities and projected a profitable operation if the ore mined can be kept at a grade of 18% or better. Assays have gone to 45%.

(3) **Silver Standard Mines** will submit a proposal to Sil-Van Consolidated Mining and Milling Co. to bring the company's base metal property near Smithers, back into production.

Two years ago Sil-Van shut down the property because of falling prices and

HINGED PLATEGRIP
BELT FASTENER No. 500

FOR HEAVY CONVEYOR BELTS OF CHANGING LENGTH

These heavy-duty belt fasteners make a strong, flexible joint in conveyor belts, belts of any width and of from 3/8" to 1/2" thickness. They offer special advantages in mines, quarries or industrial setups where length or position of belt is frequently changed, because sections can be removed or added at will. Joints are opened for this purpose by simply pulling out the hinge pin.

Easily and quickly applied on the job or in the shop. Special design gives deep compression into belting and smooth, flush joint.

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IT'S WATER, BROTHER! CF&I THINKS OF EVERYTHING!
THIS BOOTH IS A GOOD PLACE TO MEET! YOU CAN LOOK AT THE CF&I DISPLAYS IF YOU HAVE TO WAIT
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Yes, CF&I's exhibition booth will be fully equipped as a hospitality center at the Mining Show in Los Angeles. There'll be everything you need to make your stay comfortable and successful. Whether you want ice water, a place to sit down and relax, telephone service, or even secretarial assistance, you'll be able to get it at CF&I's hospitality center—Booth 440.

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MARIONS IN COPPER

This is one of more than 40 Marion machines at work for one owner in one of the biggest producing copper mines of the world. It is a 7 yard Marion 151-M, designed for continuous service in the world's heaviest digging.

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this new 40-PAGE CATALOG on alloy castings

Containing up-to-the-minute information on Alloy Castings, it covers both heat- and wear-resistant types of castings in applicable industries:

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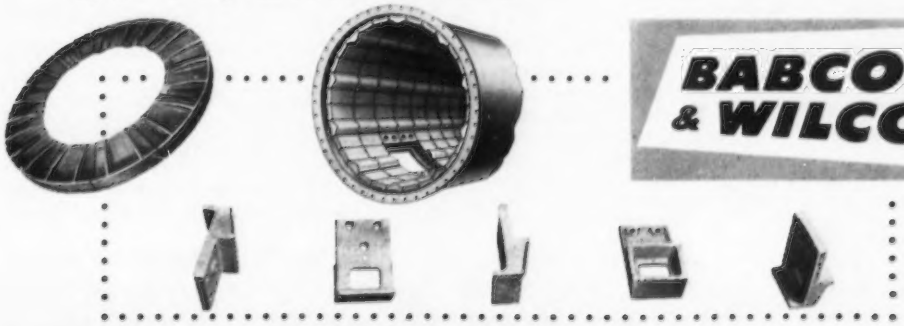
Fully detailed, it covers grades, chemical compositions, physical properties at room and elevated temperatures.

It's all yours. Just write, call or wire for Bulletin S-17 to The Babcock & Wilcox Company, Process Equipment Department, Barberton, Ohio.



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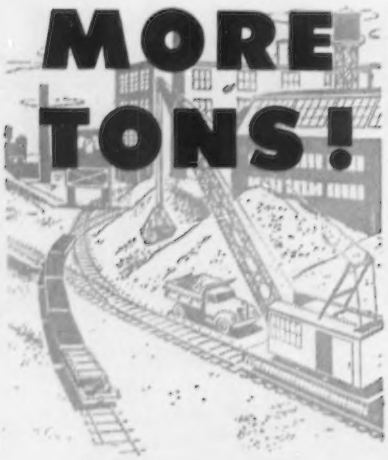
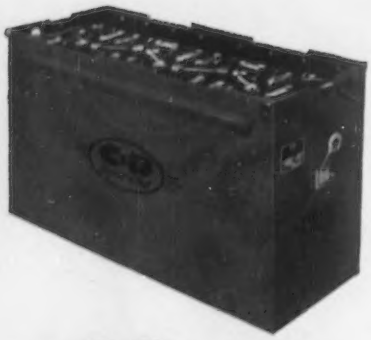
BOILER DIVISION

S-460

MOVE MORE TONS!





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C & D's extra high-capacity mining batteries work through a full shift without power let-down. This means locomotives, trammers and shuttle cars keep the day's output moving.

Why? Because with C & D Slyver-Clad® batteries you can get 66 A. H. in a 60 A. H. tray, or 125 A. H. in a 110 A. H. tray. Thus you get more power per cubic-inch of battery—You move more tons—every shift!

For details

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C&D BATTERIES, INC.
of Conshohocken, Pa.

INDUSTRIAL BATTERIES SINCE 1906
SALES AND SERVICE OFFICES
IN PRINCIPAL CITIES FROM COAST TO COAST

British Columbia *(Continued)*

shortly afterwards the company was placed in receivership for non-payment of interest on $500,000 in bonds.

Shareholders of Silver Standard have approved the spending of up to $200,000 for exploration and development of the property.

Cowichan Copper Co. Ltd., may construct a mill at its mine on Vancouver Island within six to eight months.

"There is enough ore indicated for 500-ton mill for five years, but six months from now we may have enough to justify a 1,000-ton mill. We want to be certain," said O. G. MacDonald, manager.

Emphasis on work at Cowichan has shifted from production to exploration and development, MacDonald said.

Last assay reports were for a hanging wall orebody located recently by diamond drill. Returns showed 8.4% copper for a length of 25 ft.

Granby Consolidated Mining, Smelting & Power Co. Ltd., plans to build a concentrator to treat 500 tpd ore at its Phoenix property in northern B. C.

Remaining ore will be extracted by open pit methods and it is expected that production will be achieved during the first half of 1957.

Plant will be built as far as possible with surplus equipment from the Copper Mountain operation and financed from Granby funds.

IN LATIN AMERICA

CHILE

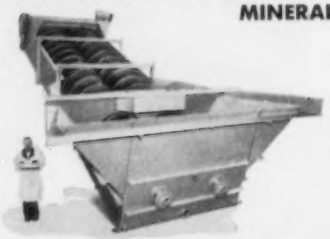
Anglo-Lautaro Nitrate Co. proposes to go ahead with an ambitious program to modernize its mining equipment and increase solar evaporation vats from 4 to 10 at the María Elena plant. These vats are 726 by 660 ft and will enable the company not only to increase the recovery of sodium and potassium nitrate but also to recover sodium and magnesium sulphate, borates, potassium perchlorate and iodine. All these salts are lost now in the residues or tails obtained from leaching the ore in the concrete vats. Program will cost some $38-million which this corporation is trying to get from Ex-Imbank.

The Central Bank decided to give a credit of 1,000-million pesos to the nitrate industry by buying nitrate from the Nitrate Sales Corp. to that amount. Some nitrate companies have found it difficult to liquidate their soft foreign currencies under the present tight market conditions while other small producers like Santa Rose de Huara in Tarapacá province, with some 600 workers, find present nitrate prices too low for their high costs.

Mining Credit Bank has bought during

EAGLE WASHERS & CLASSIFIERS

FOR ORE AND NON-METALLIC MINERALS



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Ask about minerals now being processed by Eagles. Send for Catalog 55.

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Any Type All Capacities

Riblet Aerial Tramways are notable for low operating and maintenance costs. They operate over the roughest terrain or level ground and provide rapid and dependable transportation in all kinds of weather. With modern automatic devices, labor has been reduced to a minimum.

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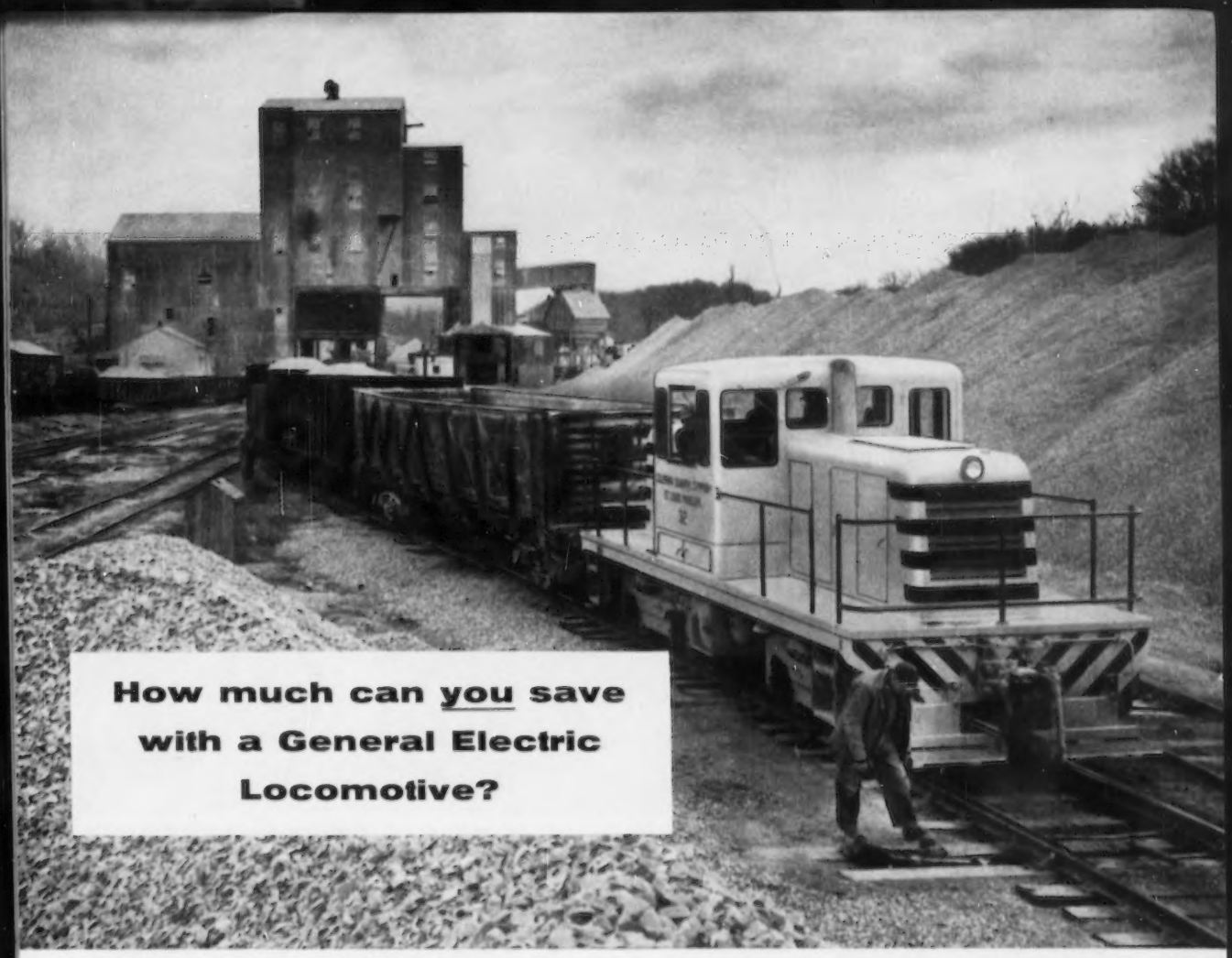

How much can you save with a General Electric Locomotive?

AT COLUMBIA QUARRY COMPANY . . .

General Electric 50-ton Locomotives Haul 8000 Tons a Day and Cut Costs!

E. A. Heise, Superintendent of the Columbia Quarry Company's plant in Columbia, Illinois, says, "You just board a G-E diesel-electric locomotive and run it. It's always ready to go . . . ready to do the job!" Columbia is sold on their two efficient, powerful 50-tonners. In fact, they ordered a 35-ton G-E diesel-electric to replace a gas-mechanical locomotive at another location.

Yard switching and hauling crushed rock in the extremely dusty atmosphere of a limestone quarry and processing plant can be ruinous to any piece of machinery. Yet, G-E locomotives operate smoothly and well with minimum regular maintenance. And, **combined** maintenance and operating expense is just 1/3 what it was for former motive power!

Columbia Quarry Co. has realized big savings in track maintenance, too! Swivel-truck construction provides low weight per axle, permits the wheels to follow the rails freely, and reduces binding and straining on both the locomotive and the track.

WHAT ARE YOUR HAULAGE REQUIREMENTS? From the wide range of G-E industrial and mine locomotives—diesel-electric and straight-electric, for both underground and surface haulage, there's one fitted to your needs.

For a survey of your haulage requirements, without cost or obligation, contact your local G-E Apparatus Sales Representative. General Electric Co., Locomotive & Car Equipment Dept., Erie, Pa. 120-88

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Longer Life,
Better Performance,
Lower Cost
WITH ELECTRIC DRIVE!

GENERAL ELECTRIC

See this unit at Mining Show, Los Angeles, Calif. Booth No. 131

Suspended magnet gives you cleaner ore on conveyor belts traveling up to 600 fpm — *and faster*

A Stearns rectangular suspended separation magnet gives you maximum tramp iron removal — even on heavily loaded, unusually fast conveyor lines.

The Stearns rectangular magnet design permits its powerful, deep penetrating magnetic force to effectively remove tramp iron from entire width and depth of material burden — even at belt speeds in excess of 600 fpm. This magnet operates efficiently where other types of equipment can't do the job.

Greater Flexibility

Stearns suspended magnet overcomes space limitations because it can be placed over the head pulley, or anywhere along the belt. Sometimes it's set up to remove tramp iron before ore moves onto the conveyor — thus safeguarding the belt and other processing equipment from damage.

Stearns suspended magnets are economical to install and operate — no need to modify existing conveyor installations.

Custom-Built

Magnetic specialists at Stearns design and build rectangular or circular suspended magnets, electro or permanent magnetic pulleys in standard sizes, or to your individual specifications. Get complete details from your Stearns representative or write for bulletin 25D.

Check these advantages

- *All-welded, moisture-proof construction*
- *No moving parts that require replacement*
- *Single-coil construction for magnetic field stability*
- *Suspension cables, where required, let you change magnet's angle of inclination quickly*
- *Vacuum-impregnated windings for long life, dependable operation*

1159

STEARNS MAGNETIC PRODUCTS

A DIVISION OF THE INDIANA STEEL PRODUCTS COMPANY • VALPARAISO, INDIANA

624 South 28th Street • Milwaukee 46, Wisconsin

How giant jaw crusher is changing the industry

● Here's the giant of them all . . . the *world's first* 4248 overhead eccentric jaw crusher . . . the new PIONEER powerhouse that others are striving to copy.

Until introduction of this crusher, there was no equipment available that completely satisfied the mining industry's need for a crusher which could combine giant capacity *and* low cost. In filling the need, the new PIONEER 4248 is changing the thinking and production methods of the industry.

Big production with 5 big savings

Typical field reports indicate it isn't unusual for a PIONEER 4248 to crush rock at 700 tons per hour with 100% crushing and a jaw setting of only 7 inches.

But at the same time this big crusher is breaking production records, it is also saving you money. Initial cost is much less than that of crushers weighing considerably more . . . installation cost is substantially lower . . . and it costs less to maintain. It also saves drilling and blasting costs because it can take ore up to 40" x 46" in size; it saves loading costs because fewer and larger loading machines can be used.

Why maintenance costs less

The PIONEER box-type, all-welded steel base gives added strength with over-all reduced weight. Built like a girder, this construction prevents bending of the sides, distortion and damage to bearings and shaft. Welding methods produce stress-relieved sections . . . thus retaining the original strength of the steel from which the base is fabricated.

Other features which cut maintenance and down time: jaw plates of tough manganese steel are designed to absorb cold flow and peening . . . split jaw plates are reversible for double wear . . . self-aligning anti-friction bearings are precision fit for smooth and lasting performance . . . inner and outer eccentric shaft bearings, mounted closer together than on any other anti-friction bearing crusher, reduce strain. This closeness of bearings, along with patented seal, eliminates areas of excessive stress, thus making an overly-large diameter shaft unnecessary.

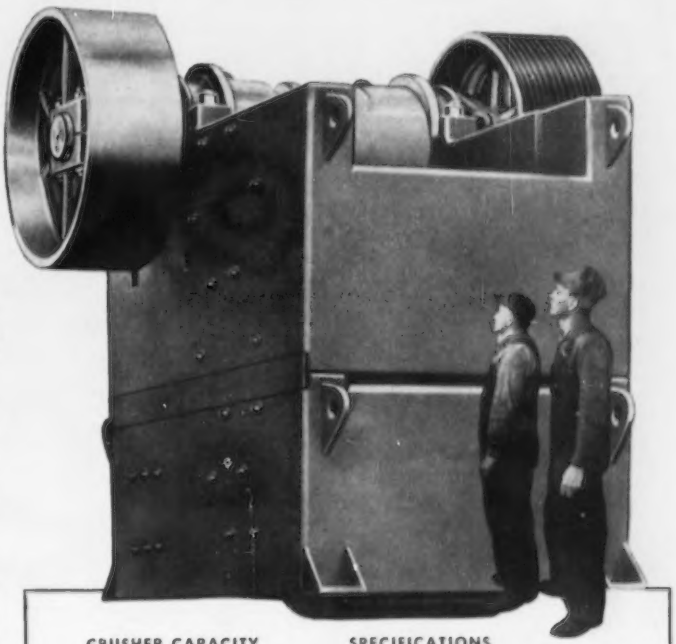
Two tension rods

Twin tension rods offer greater safety. Should one break, the other keeps crusher secure.

In rare cases when repair *is* needed, oil pressure expands inner bearing races so bearings slide easily on the shaft and may be quickly removed for inspection or renewal. A hydraulic ram holds pitman arm forward when you need to replace toggle plate. Split flywheel hubs make renewal and installation simple. Jaw plates can be quickly reversed without special tools.

Ask your crusher salesman these questions:

1. Are bearing housings saddle-mounted to assure constant alignment?
2. Is it possible to remove bearings hydraulically?
3. How closely spaced are inner and outer bearings?
4. Can jaw setting be adjusted by hydraulic means?
5. Can toggle plates be changed with hydraulic assist?
6. Are flywheels provided with split hubs for easy removal?
7. Is crusher made with split base for easy installation?
8. Does crusher have 2 tension rods?



CRUSHER CAPACITY

Field operations indicate that for each inch of jaw opening, capacity increases approximately 100 tph. This rate is with a relatively high crushing percentage. In field installations, production has reached 700 tph with 7" setting.

SPECIFICATIONS

Jaw opening	42"
Width of jaws	48"
Range of setting	5"-12"
Over-all depth, moving jaw	104"
Over-all depth, stationary jaw	90"
Weight (approximate)	94,200 lbs.
HP required	180-210

For further details, write Pioneer Engineering Works, Inc., Minneapolis, Minnesota (subsidiary of Poor & Company, Chicago) or your nearest PIONEER Distributor.

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☐ JAW CRUSHERS	☐ APRON FEEDERS	☐ BUZZER SCREENS (LIGHT DUTY)
☐ ROLL CRUSHERS	☐ GRO FEEDERS	☐ CONTINUFLO CONVEYORS

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WILFLEY CONCENTRATING TABLE

many profitable applications in modern metallurgy

No. 6 Wilfley Table with variable speed V-Belt motor drive.

No. 11-D Wilfley Table showing concrete foundations.

No. 12 Wilfley Table with variable speed V-Belt motor drive.

No. 13 Spec. Wilfley Table with overhead Lamp, as Flotation Pilot Table.

The **genuine WILFLEY TABLE,** as manufactured by Mine & Smelter, has been an important factor in the success of many metallurgical processes for years. There are still many applications where the Wilfley Table is of particular value and cannot be equalled for economical and efficient performance. Some of these are . .

- **Before or after flotation for recovery of mineral not readily recovered by flotation.**
- **As pilot tables following flotation to indicate efficiency of flotation.**
- **To concentrate low grade mineral producing a high grade concentrate for further treatment.**
- **To wash and clean inferior coals, iron ore, etc.**
- **In metal and reclamation plants.**
- **For two or more mineral separations from flotation concentrates, previous table concentration or from original table feed.**

The Wilfley Table has an easily adjustable stroke from ⅝" to 1", a speed range from 240 to 300 strokes per minute, an adjustable table inclination from zero to 1" per foot, and a selection of wood riffles of various depth and taper . . . all of which permit a flexibility to best meet the conditions of each application.

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These rigid non-conductive explosive boxes represent a prime safety investment. Made entirely of wood-tongue-grooved and dovetailed construction . . . no metal parts . . . automatic lock . . . rubber band spring . . . moisture-resistant. Box sizes are based on 1¼ x 8" sticks.

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For Tamping Explosive Shots: Poles are round, made of Hardwood. Sizes to 10' long.

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These poles are made of straight grained wood and are coupled together with removable wood pins held in place in recessed grooves by a rubber band and can be quickly connected and unconnected. Couplers and Head Blocks are 4, 5, and 6 inches in diameter. Please specify size when ordering. Poles are 1½" in diameter.

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Spangler, Pa.—Catalog on Request

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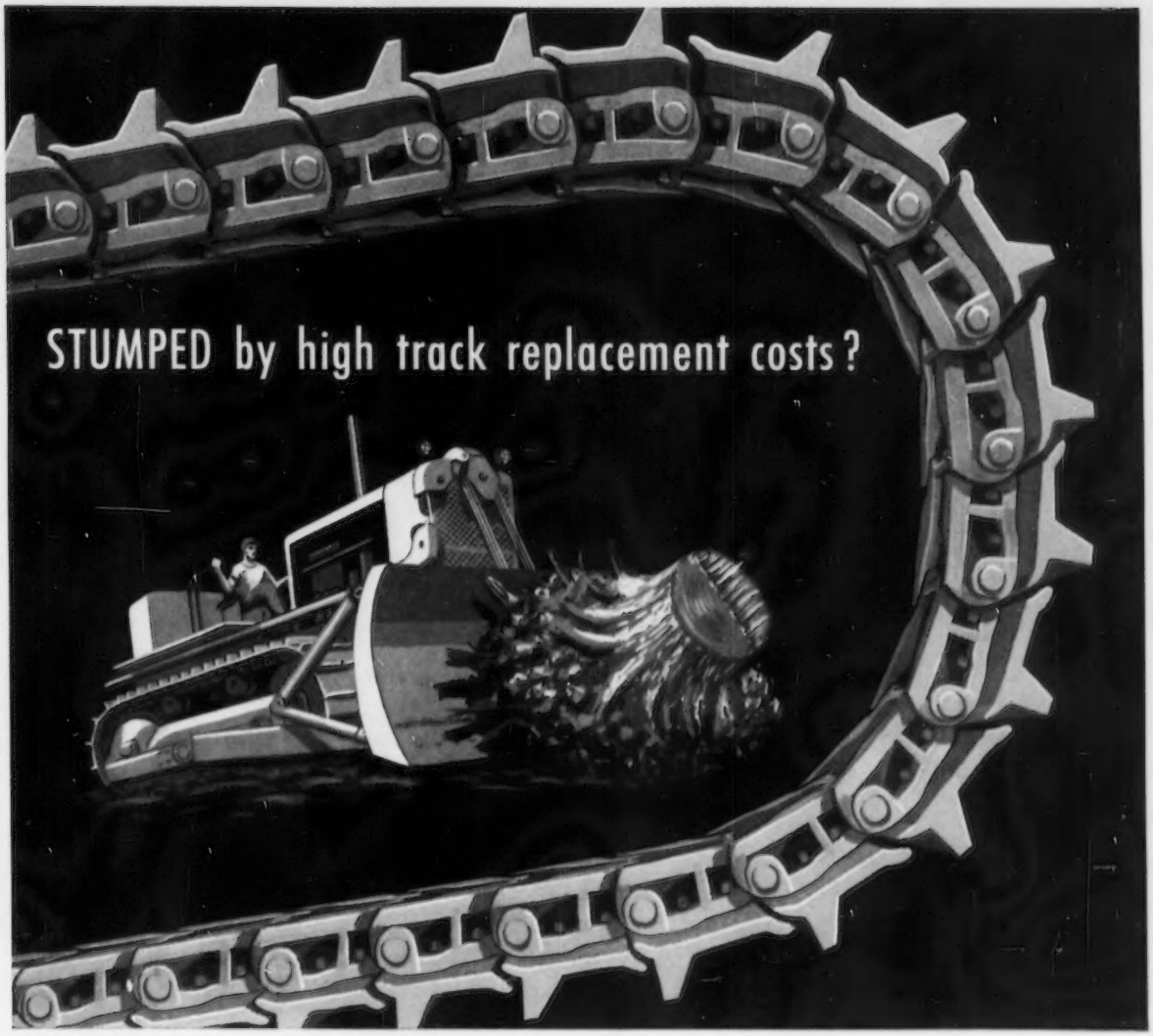
Chile *(Continued)*

the period January-May of this year 131,754 tons of ore and concentrates, an increase of 10.3% over the same period last year.

Japan has been buying pig iron from the Corral plant in Valdivia—and Chilean copper and lead concentrates which Japanese steamers are taking to Yokohama and Kobe. The interest of Japanese copper smelters on Chilean concentrates is on the increase.

CORFO (Chilean RFC) recently approved a loan of 10-million pesos to Cia. Minera Arica and approved the upping of Pilpilco's capital from 65- to 150-million pesos. Pilpilco is a mining company controlled by CORFO.

Charles M. Brinckeroff, now vice president of Chile Exploration Co. and until recently general manager of operations for Anaconda in Chile, has been awarded the Orden Al Mérito by the Chilean government for long and distinguished services rendered to the mining industry and to the country during his 20 year's stay in the country, first as Andes' superintendent and then general manager from which post he was transferred to Chile Exploration Co. with the same rank, later being made general manager for both Andes and Chile. Chile's Secretary of State, before presenting the order, praised the brilliant services rendered by Mr.

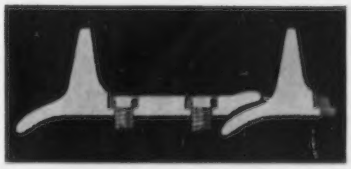


Switch to extra-tough AMSCO® MANGANESE STEEL TRACTOR SHOES

When the going is extra tough, as in rocky areas or abrasive mineral soils . . . tractor shoe replacement can become a major cost item. Both repair time and down time eat up profits.

Switch to "the toughest steel known" . . . Amsco Manganese Steel . . . for tracks and grouser bars. Check their much longer service life against the moderate extra cost. Add to this the greater efficiency and pulling power of your tractor, over a longer period of time. The answer: *important operating economies.*

Amsco Manganese Steel gives excellent resistance to abrasion accompanied by impact . . . actually *work-hardens* in use. Write for full information on long-wearing Amsco Manganese Steel Tractor Shoes—the economical answer to high track-replacement costs.



COUNTER-SUNK BOLT HOLES

Amsco Track Shoes have holes countersunk for less wear on bolts. Saves cost of replacing bolts when changing shoes.

AMERICAN Brake Shoe COMPANY

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The treads of Firestone Nylon Tires are built to give maximum traction on the toughest haul, and they are extra tough to resist cutting. Double-thick sidewalls give added protection against cuts and snags.

Firestone's Safety-Tensioned *Gum-Dipped*® nylon cord body gives the greatest protection against impact breaks . . . flex breaks . . . heat failures . . . and water damage.

Firestone has a complete line of nylon off-the-highway tires . . . job engineered tires for every piece of earthmoving equipment.

Call your Firestone Dealer or Store for cost-cutting Firestone Nylon Tires and complete off-the-highway tire service.

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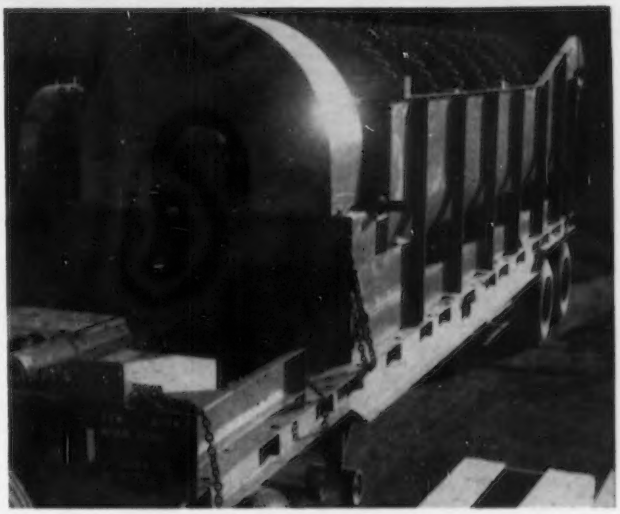
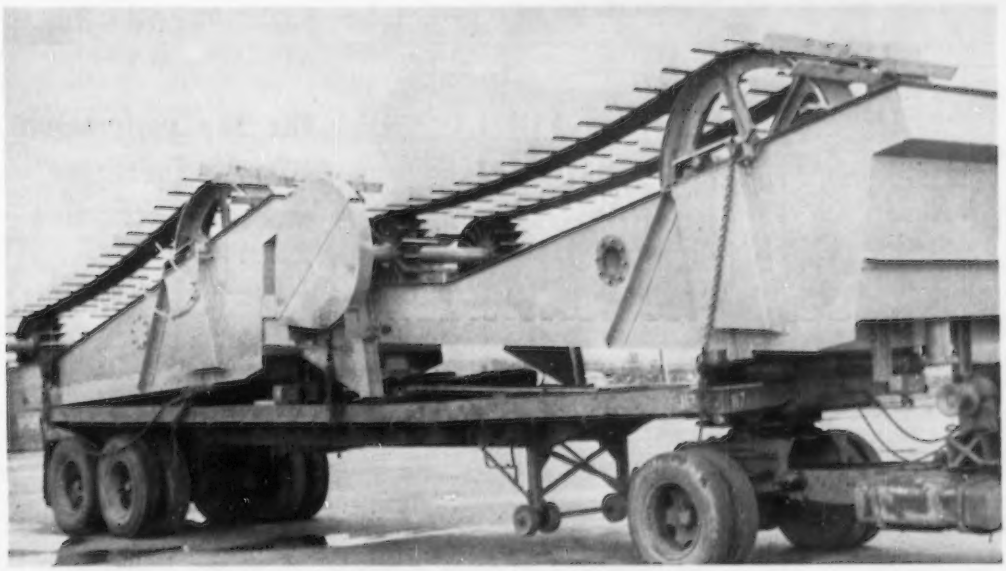
AKINS and Esperanza Classifiers, made by Colorado Iron Works, chosen for the Uranium Reduction Company Mill.



One of the 78" Akins Spiral Classifiers used in closed grinding circuit. Note patented serrated shoes which improve drainage, reduce wear, and facilitate digging the spiral into a partially solidified bed after shut-downs.

Two of the 7' 6" x 18' Acid Proof Esperanza Drag Classifiers, manufactured by Colorado Iron Works Co., used in sand-slime separation.



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A SUBSIDIARY OF THE MINE & SMELTER SUPPLY CO.

Chile *(Continued)*

Brinckeroff both to the Chilean copper industry and to the country.

Rancagua, railroad depot for Braden Copper Co. on the railroad from Santiago to Puerto Montt, has been rejected as a possible location for the electrolytic copper refinery which Empresa Nacional de Fundiciones will build to refine the blister from Paipote and the new smelter to be constructed in Central Chile at a location not yet decided upon.

The Mining Bank will start building at the end of the present year two 400 tpd leaching plants to treat both oxidized and mixed sulphide-oxide copper ores at El Salado and Punta del Cobre, Atacama province. At these two locations the Bank has been operating flotation mills for close to 30 years.

Friedr. Krupp, Essen, and the Chilean Ministry for National Defense have signed a contract in Santiago which is reported to provide the basis for the following projects:

Krupp will deliver machinery and equipment for construction of a shipyard in Talcahuano; financing of up to $6-million will be done by Krupp on a credit basis. Krupp is also reported to have offered construction of an ore preparation plant and of a diesel motor plant both of which would be controlled by the Chilean Air Force. Finally, Krupp is said to have offered construction of a copper refinery plant, construction cost of which is estimated to amount to $15-million.

MEXICO

The two largest fluorspar mines operating in Mexico are producing more than 9,000 tpm of metallurgical grade.

Almost adjacent to each other in the State of San Luis Potosí, the mines export their production to U. S. steel mills.

One mine, La Consentida, is open cut, and the other, Las Cuevas, has underground workings; they are similar geologically. Both are related to a contact between Cretaceous limestone and later Tertiary rhyolite flows. Primary geological difference is that although at La Consentida considerable ore is found replacing brecciated rhyolite just off the contact, the fluorspar also is found replacing some of the limestone beds close to the contact. At Lac Cuevas the fluorspar thus far has been found in irregular bodies within the brecciated rhyolite zones a short distance from contact with the limestone but not replacing the limestone.

La Consentida, operated by Minerales de Metales Industriales, wholly-owned subsidiary of Pennsalt International Corp., Philadelphia, is located in a mountainside 40 miles southeast of the city of San Luis Potosí.

Operations currently are at a rate of 50,000 tons a year. Although exploration still is under way, the company estimates proven reserves at 200,000 tons of 55 to 85% effective fluorspar.

An outcropping, the deposit is being worked through bench mining. There are eight benches, 200 ft high and 300 to 400 ft long. Last month the Denver Equipment Co. finished a $50,000 mill expansion at the mine. Output is hauled to San Luis Potosí for grading, sizing and assaying.

Las Cuevas, a half-mile south of La Consentida, began as an open cut mine but has shifted operations underground. Two levels are being worked, at depths of 90 to 150 ft, and a third level has been started at 210 ft. Output currently is 60,000 tons a year. Las Cuevas is owned by private individuals, principally Ralph Miner.

Mining is carried out in room-and-pillar fashion. There are 12 to 18 holes drilled for each blast, using 40% dynamite. Ore is lifted through both a single-hoist shaft and a double-hoist shaft. This ore passes over a grizzly then feeds into orebins. Output is hauled to a "patio" at San Luis Potosí where it is reduced in a jawcrusher. Acid-grade fluorspar is culled by hand.

Some 2,000 geologists from 110 nations, including the U. S. and Russia, convened in Mexico City Sept. 4-11 for the 20th International Geological Congress.

Among the five symposia conducted were those devoted to manganese deposits throughout the world and to world-wide

NEW BULLETINS

Latest information on new techniques and equipment

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- ☐ Booth Flotation Machine
- ☐ Laboratory Flotation Machine
- ☐ Rubber Covered and All Rubber Impellers
- ☐ Ore Testing
- ☐ Laboratory Ball Mill Rolls And Dryers
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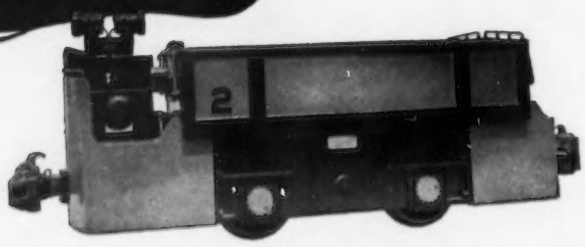
MINERALS SEPARATION

MANUFACTURE • EQUIPMENT

GREENSBURG EIGHT TON MONITOR

Storage Battery Locomotives

...for top performance "Double Equalizers" make the difference



The Greensburg 8 ton Monitor is equipped with two glass insulated motors, contactor type controller and double equalizers. These double equalizers make the difference in performance . . . more tractive effort, better brakes, better riding qualities and longer battery life than any other storage battery locomotive of equal weight and battery capacity!

All Greensburg locomotives are Custom-Built to meet your requirements in both single and double motor drive with drum, cam or contactor type controllers.

For more earning power per invested dollar specify Greensburg Storage Battery Locomotives.

GREENSBURG MACHINE CO.

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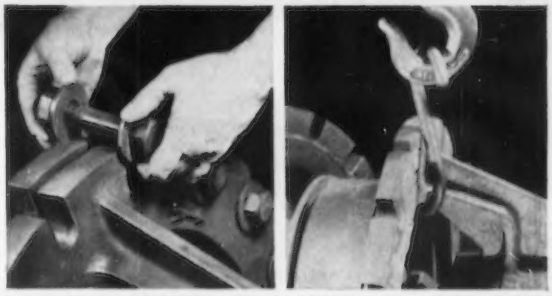
ALLIS-CHALMERS Solids Handling PUMPS

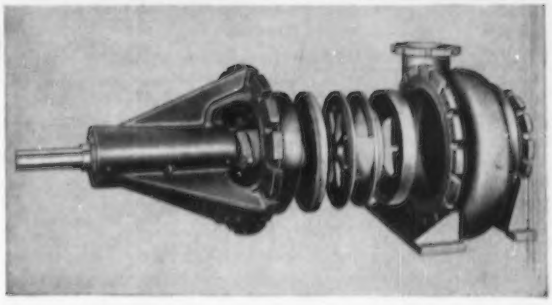
1 Troubles are few and far between

One user of Allis-Chalmers solids handling pumps said, "We've been operating them for 8 months without loss of capacity." . . . another said, "We ran it for 13 months before we replaced the first part."



2 Inspection is an easy routine

Take-down and re-assembly require less than half an hour. Merely disconnect the drive . . . loosen the nuts on casing bolts . . . and lift out the bolt assemblies. Then, swing out the rotating element. There's no need to disturb the suction or discharge piping.



3 Parts replacement is fast, economical

Wear is limited because there are only five wearing parts. Many parts are interchangeable among several sizes of Allis-Chalmers solids handling pumps so you won't have to carry big spare parts stocks. What's more, because parts replacement *is* infrequent . . . because it's so fast and simple . . . down-time production interruptions are held to a minimum.

In addition to sound design, Allis-Chalmers solids handling pumps feature special hard alloy *Ni-Hard* and extra thickness of metal in critical spots. Then, too, each A-C pump is application engineered to meet the specific conditions under which it will be used.

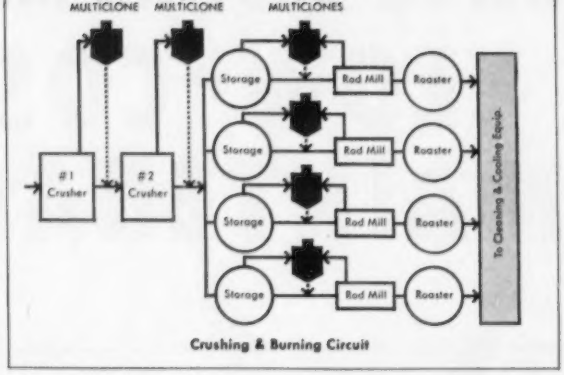
Remember, Allis-Chalmers can furnish the complete pumping unit—pump, motor, control and drive. Next time you need a solids handling pump, call your A-C representative or write—Allis-Chalmers, Milwaukee 1, Wisconsin. Ask for Bulletin 52B6381.

A-4603

A-C ALLIS-CHALMERS

ALLIS-CHALMERS

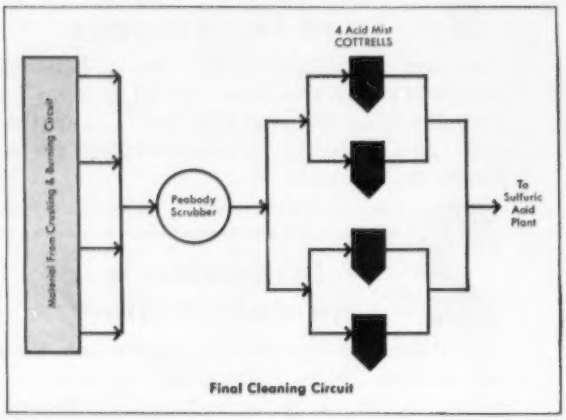
6 MULTICLONE DUST COLLECTORS



Crushing & Burning Circuit

and 4 Western Precipitation COTTRELLS *serve Anaconda at Yerington!*

These Cottrells are the newest Western Precipitation acid mist design



Final Cleaning Circuit

Anaconda selected six Western Precipitation MULTICLONES and four Western Precipitation COTTRELL Electrical Precipitators to handle key recovery operations at its new $30,000,000 Yerington installation.

THE 6 MULTICLONES are installed in the sulfur crushing plant where sulfur ore is crushed and ground for use in the Roaster operations. Since this crushing and grinding develops a considerable dust problem, the primary crusher (a jaw type), the secondary crusher (a cone type), and each of the 4 rod mills has an individual 9VG Multiclone Mechanical Collector installed for recovering suspensions from the exhaust gases.

So efficient are these Multiclones that the exhaust gases are practically free of all visually discernible dust!

Inasmuch as each crusher and mill has its own Multiclone unit, maximum flexibility in plant operation is achieved—with greatly simplified duct and dampering requirements. Savings in plant maintenance are also obtained by having the Multiclones ahead of the fans so that abrasive dusts are removed and only the clean gas reaches the fan equipment.

THE 4 COTTRELLS are installed in the acid plant process to electrically precipitate the acid and water mist from the SO_2 gas generated in the Fluosolid Roasters. From the Cottrells the gas passes directly into the contact acid plant where it is converted into sulfuric acid.

The four Cottrells have 100 pipes each, and are designed for a capacity of 33,900 cfm at 110°F. with a negative pressure of 30″ w.g. and a recovery efficiency of 99.0%!

These Cottrells are the first acid mist precipitators to incorporate a new advancement developed by Western Precipitation engineers... top support of the high voltage electrode system coupled with wind-swept insulator compartments. This new design eliminates difficulties associated with conventional oil-sealed insulator compartments and is a major advancement in this type of Cottrell design.

This installation is one more example of the adaptability of Western Precipitation equipment to varying operating requirements. Let our experienced engineers study your particular problem and make helpful recommendations. No obligation, of course!

® "Multiclone"

COTTRELL Electrical Precipitators
MULTICLONE Mechanical Collectors
CMP Combination Units
DUALAIRE Reverse-Jet Filters
HOLO-FLITE Processors

Western Precipitation Corporation

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Mexico *(Continued)*

developments in geo-chemical exploration.

In addition to the scientific sessions, all held at the famed University of Mexico, special trips were organized to all of Mexico's major mining districts.

VENEZUELA

The rich Vuelvan Caras gold mine in Venezuela's Guayana region is being reopened after more than two years of inactivity.

A group headed by promoter Lorenzo Pio Cenari has invested over $1-million

To industries everywhere, Michigan Tractor Shovels have brought major savings in handling sand, rock and other bulk materials, stockpiling coal, loading lumber, and doing yard work. Now, here's a more unusual, but equally cost-cutting application:

SPEEDY SWITCHER for KAISER STEEL

All the in-yard railroad-car switching and spotting Kaiser Steel Corporation needs at their giant Fontana, California, steel mill is now handled by the mobile, dependable, 27 mph Michigan Tractor Shovel you see here.

Helps unload 6,000 tons of ore daily

Working around a revolving car unloader, the Michigan spots gondolas containing 6,000 to 7,000 tons of beneficiated iron ore daily. Most of these cars are towed, one by one, from trains spotted about 150 feet from the unloader. As each car is being dumped, the Michigan drives through the unloader building, turns, automatically couples and delivers another car. Complete 400 ft. cycles take only a minute. This includes time for the Michigan to move onto the unloader platform, spot and automatically uncouple the loaded car, then nudge the empty to a gently-sloping downgrade where it coasts to make connection with other cars already behind a braked pilot car. Speed like this is a major advantage —in fact, the Michigan works so fast it has time to handle all switching of *all limestone* and *silica* cars, too. Another advantage is that when the Michigan has finished unloading an ore train, a train-load of empties is practically made up—except for hooking air hose connections —for the 160-mile return trip to Kaiser's iron mine at Eagle Mountain, California.

To adapt their Michigan for railroad-car pulling service, Kaiser's crew replaced its standard 2¼ yard shovel bucket with a switching toggle mounted on a heavy spring-loaded plate. A second spring-loaded plate mounted at the rear, provided pushing surface for jobs where switch connections were not necessary.

Moves 3600-ton train-load

Sometimes, the Michigan has to move both loaded and empty trains. The day these photos were taken, for example, it pulled a train of 60 cars—each car loaded with 60 tons! Men on the job say the unit, a 133 hp Model 175A, often handles this many cars when locomotives are busy elsewhere and a brakeman is available.

Faster, less expensive than locomotives

Switching didn't always go this smoothly at Fontana. For years, switch engines handled the job. But as nine open hearth and three blast furnaces were opened and later pushed to 108% of design capacity, car traffic became heavier and heavier, and locomotive switching slower and slower. Other drawbacks showed up, too. Locomotives were expensive to buy and maintain . . . and, naturally, limited in mobility. So Kaiser officials tried a variety of highly-portable rubber-tired rigs. Their choice: Michigan! Michigan Tractor Shovels, they found, have greater traction because their four wheels are always driving, even on turns. Push-power is always high because of 3-to-1 torque converter and matched all-Clark power train. Planetary drive axles eliminate axle breakage. Top speed of 27 mph cuts job-to-job travel time.

Get a demonstration and see

Advantages like these are reasons enough, aren't they, to copy Kaiser and give Michigan a try on your job? Write us, any time, to arrange a demonstration on the work you want this rubber-tired rig to do—switch cars, load sand, stockpile coal, etc. Just name the jobs and size machine you want to see (15 cubic feet to 2¼ cubic yards, 44 to 165 hp).

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Mexico *(Continued)*

developments in geo-chemical exploration.

In addition to the scientific sessions, all held at the famed University of Mexico, special trips were organized to all of Mexico's major mining districts.

An unusual mining venture has been undertaken by a group of private businessmen, largely from Vancouver, B. C. The Canadian company, Mexuscan Development Corp., plans to mill ore mined at least half a century ago at an abandoned mine in southeastern Sonora.

The mine, Minas Quintera, dates back to 1650 and was successively worked by the Spanish, British and French before it was shut down in 1908. According to company officials, rock that was not considered commercial at that time has been upgraded to the status of ore by modern mining practices.

Company investigators claim that a half-million tons of what may be considered as ore today was discarded above ground. And that in first three levels of the 16-level workings, there is an additional minimum of 1-million tons of ore which in 1908 was considered too low grade to be commercial.

Mexuscan has purchased a used 250-tpd mill which it expects to place into operation early in October. In order of importance, the ore contains silver, copper, lead and gold. Concentrates will be shipped to the Asarco, S. A., smelter at San Luis Potosí.

VENEZUELA

The rich Vuelvan Caras gold mine in Venezuela's Guayana region is being reopened after more than two years of inactivity.

A group headed by promoter Lorenzo Pio Cenari has invested over $1-million in new machinery and buildings for the mine, discovered in 1942 in the wilderness 40 miles east of Tumeremo near the British Guiana border.

Studies by Canadian experts and approved by the Ministry of Mines and Hydrocarbons reportedly indicate that Vuelvan Caras may have a potential greater than the famed El Callao gold mines.

Ore in two veins of the Vuelvan Caras mine assays at 54.25 grams per ton, highest in Venezuela. The government-operated El Callao workings, scene of one of the 19th century's great gold rushes, yield 14 grams per ton. El Callao produced 1.7-million grams of gold last year.

PERU

Japanese Government will shortly approve establishment of a joint mining company by two Japanese companies and the Perulex Co. of Peru to develop the Inicia Tiva mine in Peru which is owned by Perulex, Mitsubishi Trading Co., one of the two Japanese investors, said.

Mitsubishi said the Mitsubishi Mining Co., the other Japanese investor, was sending three experts to Peru early this month to conduct a survey on resources in the undeveloped mine, which is claimed to hold 20-million tons of iron ore.

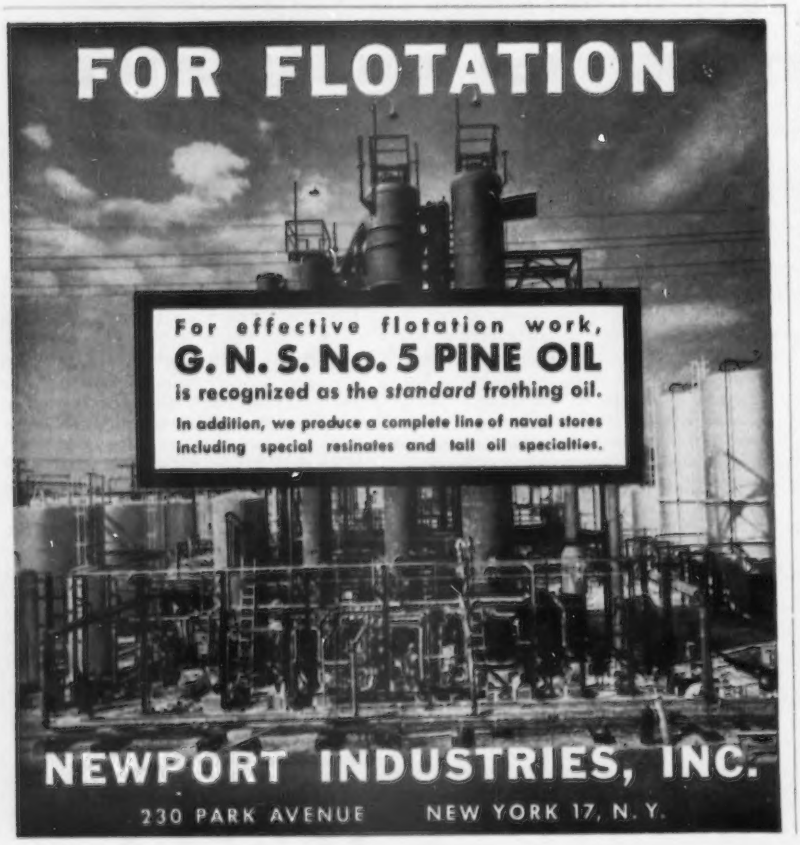
Trade sources said these companies were expected to need $3-million to establish the new company in Peru, which will turn out 1-million tons of 65% iron ore a year. The company intends to export most of the output to Japan at price of less than $6 per ton, f.o.b., sources said.

ARGENTINA

A valuable commercial placer deposit of platinum and kindred metals has been found in northern Argentina, the geophysicist, Sir Christopher Gibson, has reported to the National Mining Authority.

Sir Christopher stated that research has been begun in England to determine the special type of installation which will be required to separate the metals by electrolysis. Meanwhile, truckloads of assorted platinum powders, together with mica and solenium which have been found in the same district, are en route from the Province of Misiones to Buenos Aires.

This is the first discovery of its kind in Argentina since 1890, when British geologists and engineers found platinum associated with osmium in Patagonia.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connections were not necessary.

sign capacity, car traffic became heavier

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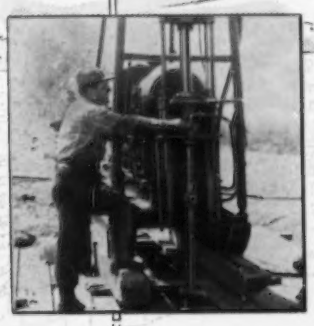

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Send in your bits that need resetting, giving full details of results obtained and conditions under which bits were used. They will be returned new—and "Oriented" to give you less diamond loss and lower your cost per foot.

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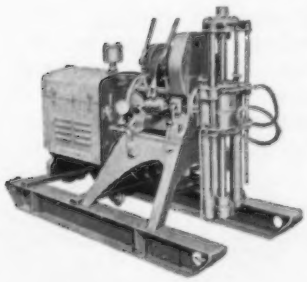

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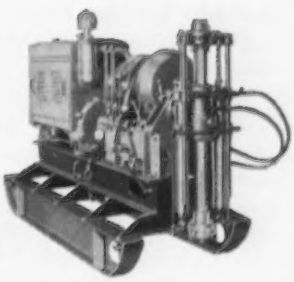

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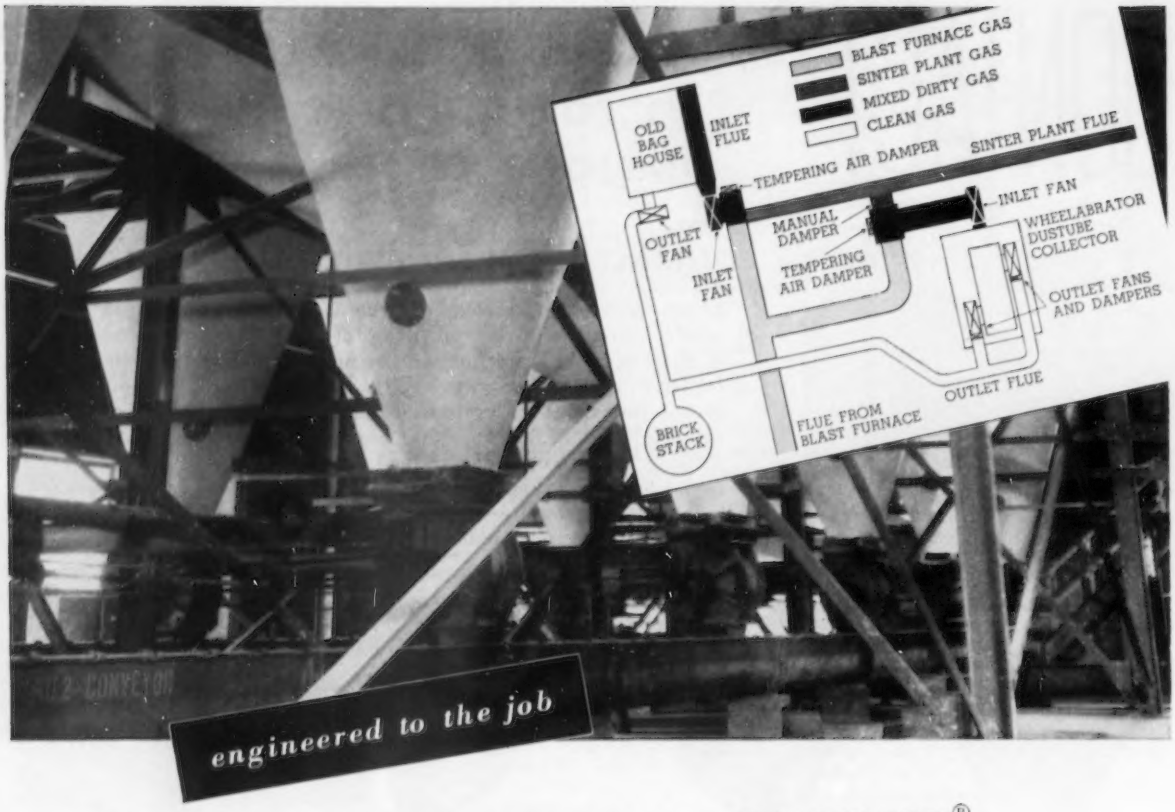

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WHEELABRATOR® *DUSTUBE*® Collector

eliminates air pollution — cleans flue gas

Increase in sintering capacity, at a prominent lead smelter, necessitated an addition to the standard baghouse collection system for the filtering of flue gas from sintering machines and blast furnaces . . . and the salvage of this valuable material.

After visits to other smelters and checking on many systems, plant officials chose a Continuous Automatic Wheelabrator Dustube collector with Orlon fabric filter tubes.

The collector installed is a 12-compartment, continuous operation model. While tubes in 11 compartments are filtering, those in the 12th are shaken to drop collected material into screw conveyors for return to the sintering plant. Each succeeding compartment is automatically shaken in turn.

The Wheelabrator Collector was engineered into the existing system and no additional operating personnel was required. Capacity was rated at 136,000 cfm. Volumes handled have been as high as 150,000 cfm. Much improved smoke conditions have been maintained at the blast furnaces and in the plant generally and valuable material has been reclaimed. The Orlon tubes have shown no wear in a year.

To better working conditions, increase material recovery and assure a clean stack in your plant, investigate the high efficiency of Wheelabrator cloth filter systems.

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Argentina *(Continued)*

Increased export quotas set for the balance of 1956 reflect the Argentine Government's desire to encourage mining activities by offering the incentive of

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3. Save Equipment! By greatly reducing the possibility of costly, time-consuming bearing failure.

Let an Alemite portable lubrication help keep tight schedules and save money for *you*. Mail coupon for complete information and free illustrated booklet!

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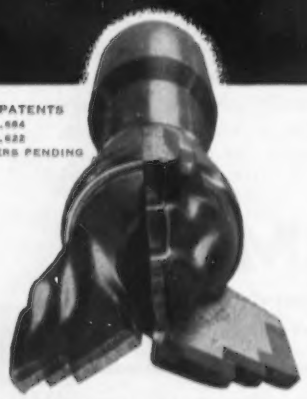

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Argentina *(Continued)*

Increased export quotas set for the balance of 1956 reflect the Argentine Government's desire to encourage mining activities by offering the incentive of export prices. Not only were quotas for a number of products raised in comparison to past semesters, but several new products were added to the exportable list.

Quotas were as follows:

Unlimited exports: alabaster, clay, rafaelite, borates, quartz, clinkers and ash, common salt, and natural sulphate of soda.

Limited exports with raised quotas (amount in kilos): asbestos, 500,000; barytes, 1-million; bentonite, 1-million; bismuth compounds, 20,000; kaolin, 200,000; calcite, 300,000; celestite, 500,000; copper compounds, 4.5-million; columbium & tantalum, 50,000; corundum, 200,000; chrome, 200,000; diatomite, 500,000; dolomite, 500,000; tin compounds, 500,000; feldspar, 700,000; fluorites (for metallurgical use), 2-million; volcanic sands, 600,000; graphite, 100,000; melanite, 30,000; lithium, 350,000; manganese compounds, 1-million; marble, 800,000; ochre, 500,000; lead compounds, 1-million; granitic stones, 2-million; pumice stone, 900,000; sulphate of magnesium, 500,000; double sulphates (of aluminum & magnesium), 500,000; talc, 1-million; chalk, 500,000; titanium, 1-million; travertine, 800,000; vermiculite, 800,000; gypsum, 1-million; and zinc compounds, 1.5-million.

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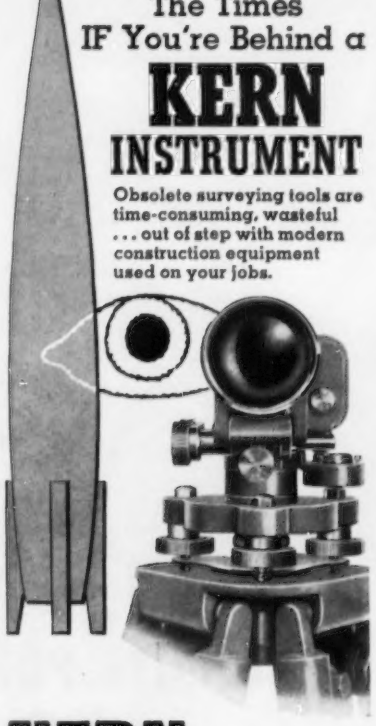

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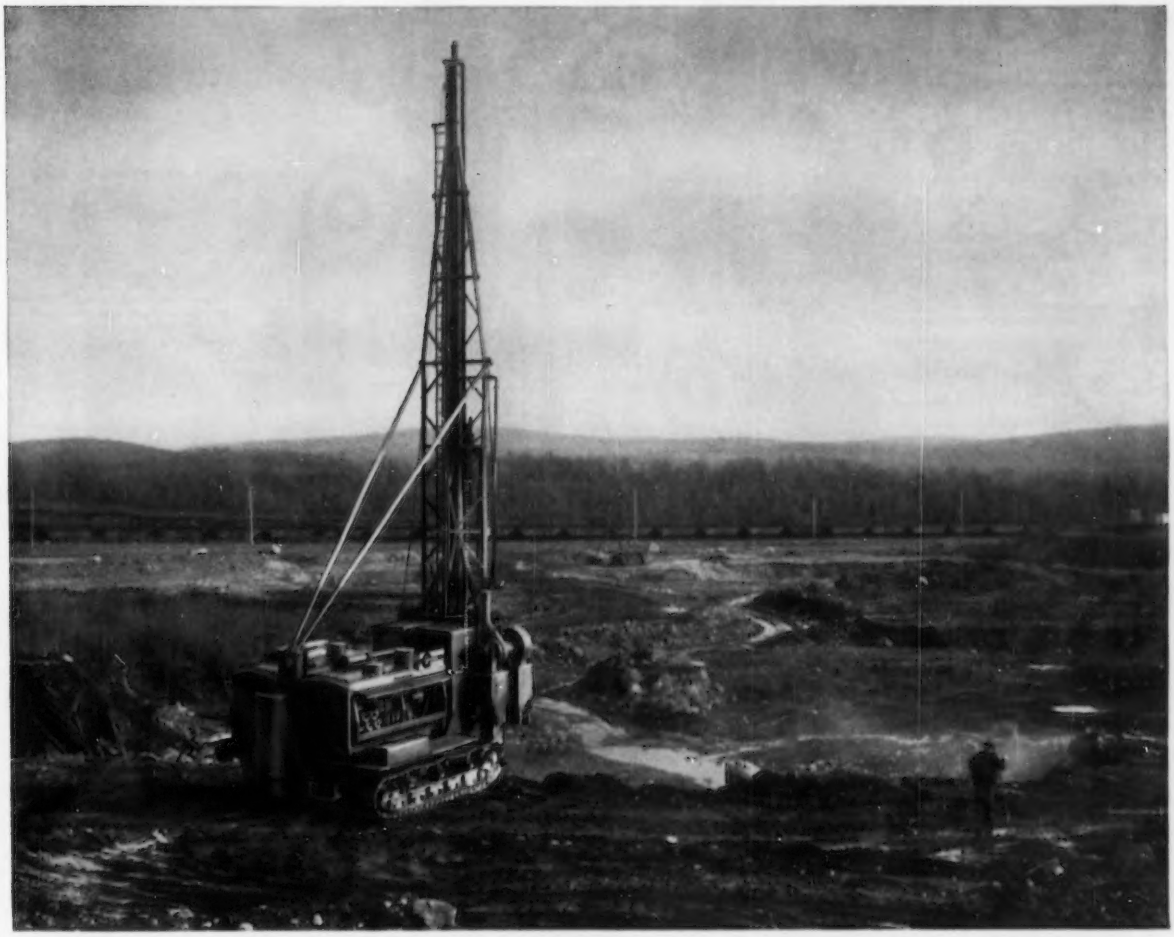

Highly maneuverable, the self-propelled Ingersoll-Rand Quarrymaster is powered by two 415 cfm heavy-duty air compressors. In only minutes it moves from one hole to the next on air-operated tracks.

Nickel alloy steels help Quarrymaster drill blast holes that speed-up output

Operators of this open pit mine in upper New York State save time, sink fewer blast holes, and yet substantially step-up ore output of the property.

The Quarrymaster puts down large diameter holes thus making it possible to drill them much farther apart, center-to-center, and still secure equal or better fragmentation than conventional drills which put down a closer pattern of smaller holes.

Heat-treated nickel alloy steels help the Quarrymaster drill up to a 6″ hole at a rate of 10 or more feet per hour in the hardest rock . . .

And in relatively soft rock it sinks holes at rates up to 80 feet per hour. The heart of this Quarrymaster is an air-operated piston drill, employing hard, tough nickel alloy steels for vital parts.

Take its nickel alloy steel piston, for example. This part withstands continuous brutal battering by a tremendous load of more than 200 heavy blows per minute.

Rifle bar and other components, likewise are made of nickel steels to withstand correspondingly tough operating conditions.

Where use means abuse . . . as in the Quarrymaster . . . you can improve specific properties in many metals by alloying with nickel alone or in combination with other alloying elements. Send us details of your metal problems . . . we'll be glad to help you with suggestions for your specific applications.

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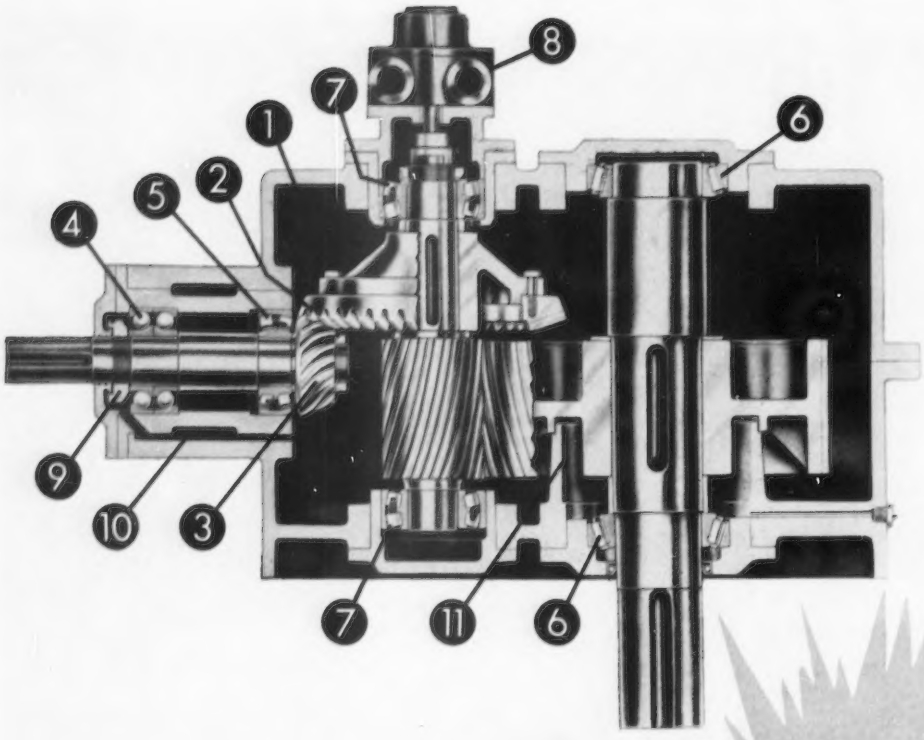

Sectional view of a Double Vertical Type Philadelphia Spiral-Bevel Speed Reduction Unit.

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These units offer a compact, dependable and highly efficient means of transmitting power at right angles. They are available for Vertical (shaft-up, or shaft-down) or Horizontal Mounting; in single, double or triple reductions . . . Reduction Ratios range from 1.5 to 1 up to 238 to 1.

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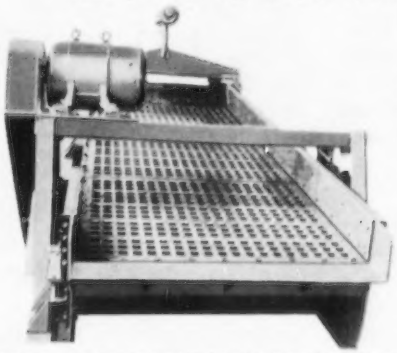

Secret of Hendrick's success is our 80 years of experience in selecting and specifying the various analyses of steel best suited for the mining industry. Hendrick perforated *H* quality steel is supplied in flat, corrugated or stepped with any desired shape and size of perforation. For more information write Hendrick direct.

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Neoprene sheathed . . . molded in lead for long service life

Rome 60 mining cables are Neoprene sheathed—molded in lead—for extreme durability and high resistance to oils, acids, abrasion and flame.

Conductors • All conductors are of finely stranded copper wires for maximum flexibility.

Insulation • A long-aging, heat- and moisture-resistant rubber compound permitting operation at 75° C., thereby providing overload protection. For high- voltage service an ozone-resistant insulation is used.

Reinforcements • On Rome 60 portable cables, a heavy reinforcing open braid locks the Neoprene sheath to the inner construction to prevent failure from twisting, pulling, flexing and sheath separation.

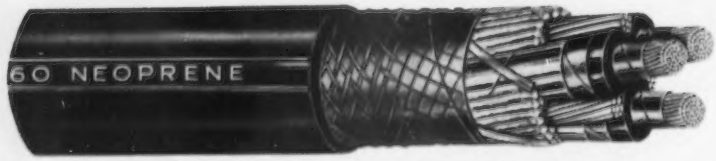
Sheath • Neoprene vulcanized in a continuous lead mold for durability and high resistance to abrasion, acids, oils and flame. All Rome 60 mine-trailing cables are surface-molded "P-105 BM" indicating full compliance with Federal and State of Penn. safety codes. These construction features, *plus* quality control, add extra service life to Rome 60 mining cables.

ROME 60 SINGLE-CONDUCTOR LOCOMOTIVE GATHERING CABLE—600 VOLTS

ROME 60 PORTABLE POWER CABLES—TWO, THREE AND FOUR CONDUCTORS
TYPE W (UNGROUNDED) UP TO 3000 VOLTS • TYPE G (GROUNDED) UP TO 5000 VOLTS

ROME 60 PARALLEL DUPLEX (FLAT TWIN) MINING MACHINE CABLE—600 VOLTS
TYPE W (UNGROUNDED) AND TYPE G (GROUNDED)

ROME 60 TYPE SHD SHIELDED PORTABLE POWER CABLE
WITH GROUND WIRES UP TO 5000 VOLTS



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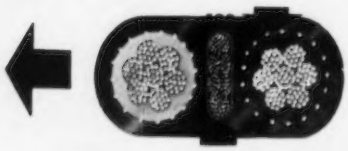
SHIELDED WITH GROUND WIRES UP TO 10,000 VOLTS

ROME 60 (Flat Twin) SHUTTLE CAR CABLE EMPLOYS INTEGRAL SHEATH CONSTRUCTION

The rugged Neoprene sheath forms a resilient web between the insulated power conductors and the ground conductor to provide maximum impact resistance. The open braid on each conductor firmly interlocks conductors to sheath. The web and sheath are an integral unit which binds the entire cable securely together.

A greater number of finer strands in the power and ground conductors, plus a closely woven fibrous covering on the ground conductor (to minimize mechanical working of the fine wire strands) increase the flexibility of the cable and protect it from constant flexing, twisting and tension.



THE ROME 60 LINE INCLUDES:

- Type SO portable cords
- Single-conductor locomotive cables
- Parallel duplex (flat twin) mining machine cables—Types W and G
- Multiple-conductor portable power cables
  Types W and G
  Types PG (power ground)
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- Portable power cable Type SH-D
- Mine power cables
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JOY electrical connectors, portable lighting lines (String-a-lite) and cable vulcanizers will solve your problems quickly and economically. Specifically designed to provide years of dependable service under the most adverse operating conditions, they seldom need maintenance attention. Built to exceed the metal mining industry's highest performance standards, and backed by more than a quarter century of intimate experience with its needs, JOY products can be relied on to contribute a lot to increased production.

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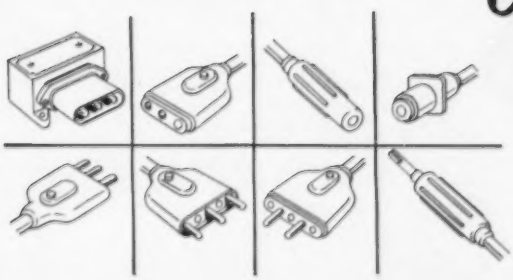

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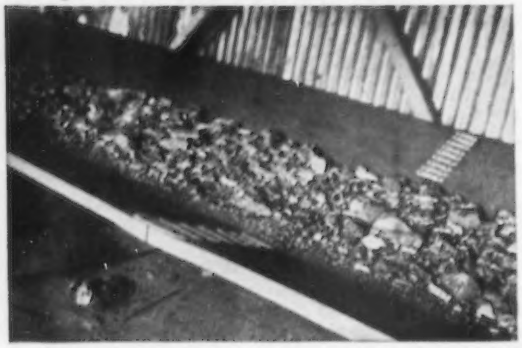

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★ Made of Steel, Monel, Stainless, Everdur. Also Promal top plates.
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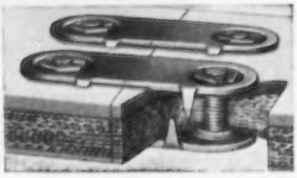

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IN THE PHILIPPINES

An agreement executed July 8 between Consolidated Mines and Benguet Consolidated vitally alters the previous arrangement between the two contracting parties. Under the earlier contract, Benguet has operated the highly profitable properties of Consolidated in Zambales province since the war on a 50-50 basis. This contract has been in litigation in Philippine courts for about three years, Consolidated alleging that since the old societe anonyma status of Benguet was legally terminated, the contract was no longer in effect. Under the new agreement, instead of 50% of profits, Benguet will receive only 25%, with the balance to Consolidated. Operation of the properties will continue under Benguet's direction but development programs of new properties shall be subject to consultation with Consolidated. It is agreed that chromite sales shall not exceed 600,000 tons per year. Certain cash payments are further to be made by Benguet to Consolidated based on past profits under the old contract.

U. S. Bureau of Mines is investigating methods to beneficiate Philippine iron-nickel ores in the Surigao area. An interesting angle is the possibility of using sugar cane wastes or bagasse as a reducing agent in the processing of the ores. Funds for the research work are supplied by the International Cooperative Administration. Earlier studies at Albany, Ore., proved that electrical smelting of Philippine ores is technically feasible. The Bureau has estimated that up to 1-million tons of nickel in alloy form might be recovered if electric smelting proves economical. Marked similarity is noted between Philippine and Cuban nickel ores that are being successfully exploited today. The Bureau's tests will probably be completed within six months, when the results will be given to the Government and to several companies who have indicated interest.

Atlas Consolidated has completed arrangements, with approval by the Central Bank, to construct an acid and fertilizer plant near its Toledo mine in Cebu. The pyrites recovered as a by-product in copper flotation will be the principal raw material. Machinery and equipment will be manufactured and installed by Saint Gobain, Chauny et Cirey, of France, at a cost of $1.6-million. Technicians from Saint Gobain will supervise installation of equipment and training of Atlas personnel to operate the plant. The overall-cost of the project will total about $3.5-million.

It is estimated that when the Toledo mill reaches its full capacity of 10,000 tpd daily production of pyrites will approximate 600 metric tons. The acid and fertilizer plant will require 200 tpd, with the balance sold to other acid manufacturers. The plant will consist of a sulfuric acid plant with capacity of 120 tpd, a phosphoric acid plant with 25 tpd capac-

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You buy more than high-strength anchors when you buy O-B shells and plugs for roof support!

You buy a fast bolting cycle, too, because these O-B units are easy to work with. They go on the bolt fast—no delays due to off-size threads. • They go up the hole fast—no hanging up half-way. • They tighten up fast—no falling out of the hole before tightening, no slipping or spinning in the hole during tightening. • They hold fast—four-way expansion of shell creates a powerful "socket" anchorage that's solidly backed up with heavy metal of the plug.

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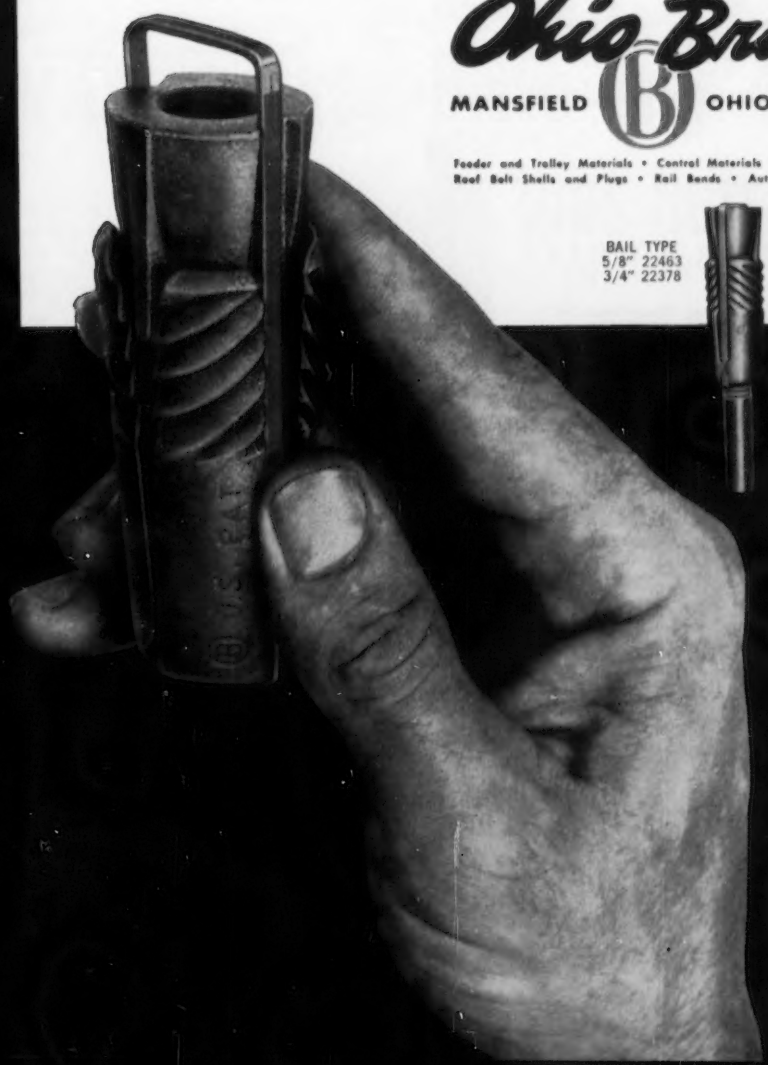

BAIL TYPE
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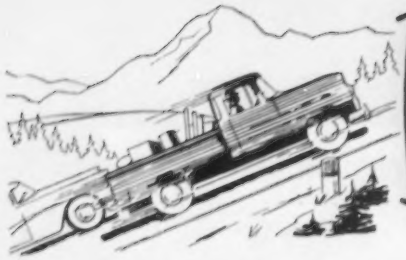
3/4" 22378

STANDARD
5/8" 21890
3/4" 21889



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Warn Hubs on your 4-wheel drive make 2 vehicles out of 1, because you can use it as a light duty 2-wheel drive pickup, or 4-wheel drive work horse. Warn Hubs save gas, tires, repairs; stop front gear whine and shimmy in 2-wheel drive—and you have 4-wheel drive whenever needed. Automatically, too, with Warn Lock-o-matics! They select free-wheeling 2-wheel drive or tractive 4-wheel drive *as you shift!* When road conditions change, you just keep right on going *in whatever drive is required.* With Warn Hubs, whenever you use 2-wheel drive you're saving on operating costs – and because you have 4-wheel drive too, it's the only light vehicle you need! Lock-o-matic (and Locking) models for all makes 4 W. Ds. to 1½ tons. See Warn Hubs at your dealers, or write:

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Acker Teredo Core Drills operating on the Colorado Plateau have already "been-in" on some of the biggest uranium strikes in the West!

There's a reason! They're lightweight, yet designed and built to stand-up under the most rugged conditions. Your choice of power plant and mounting on trailer or small truck.

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a complete line of Soil Sampling Tools, Diamond and Shot Core Drills, Drilling Accessories and Equipment

Here's one of the portable, self-contained Acker Teredo Drills already in use on the rough, remote terrain of the Colorado Plateau. A built-in water supply tank permits this rig to operate anywhere!

Philippines (*Continued*)

ity and other units. Initial production will total 127,200 tons, consisting of 96,400 tons of mixed fertilizers, 19,700 tons of superphosphate and 11,100 tons of triple superphosphate.

Mati iron mine at Davao, operated by Atlas Consolidated, made its first shipment of iron ore to Japan in July, consisting of 6,500 tons assaying 64.6% Fe. A second shipment will be made later in the month of 9,500 tons. Four shipments totaling 30,000 tons are scheduled for August. Positive ore reserves at Mati are estimated at 1.57-millon tons.

IN AFRICA

Anglo-Transvaal Consolidated Investment Co. has acquired sole prospecting and mining rights in the North Charterland Concession, Northern Rhodesia. Among the "notable results" gained from exploration to date is a copper reef in the Myezi area with copper samples ranging from above 7.01%.

Anglo-Transvaal controls New Klerksdorp Gold Estates, Rand Leases GM Co., Villiage Main Reef GM Co., Virginia OFS GM Co., Merriespruit GM and Hartbeestfontein.

Anglo American Rhodesian Exploration has started exploring phosphate deposits in the Lake Chilwa area of Southern Nyasaland. African Explosives and Chemical Industries, another subsidiary of Anglo American Corp., is also investigating phosphate, in Southern Rhodesia.

Mineral prospecting in Mozambique under a 5-year concession will be carried on by Central Mining and Investment Corp. Concession, which carries a 20-year option, covers beryllium, tantalum, zirconium, diamonds, but not radioactive materials. Investment will be more than $350,000.

Full scale development is underway in the "richest area" in the Free State goldfield, with connection completed between the No. 41 haulageway north from Western Holdings and the 43 haulage south from Free State Geduld. It was near here that the 23,000-in. dwt borehole result was obtained in 1946.

Gold mining operations in South Africa for the first six months of 1956 have been announced. Comparable figures for 1955 are in brackets:

Tons milled 12,233,500 (32,507,000); oz gold 7,509,427 (6,869,470), equal to 4,458 dwt per ton (4,226); value $263,216,800 (242,415,000); working costs $198,763,000 (182,251,000) equal to $5.90 per ton (5.61); working costs per oz $26.47 (26.63); uranium profits—subject to adjustment—$32,309,000 (20,844,000).

Two of the oldest Rand mines are closing down because of depletion of payable ore reserves. Welgedacht GM saw its biggest surge in the high-price times of the

Prospecting. The 'Jeep' Truck is a workhorse for towing equipment over rough areas. With the extra traction of its 4-wheel drive, it reaches off-road areas where there's work to be done. Its partner, the Universal 'Jeep' is equally adaptable for prospecting needs.

How the 4-Wheel-Drive 'Jeep' family does more jobs better...faster!

Mobile Power. This 4-Wheel-Drive Universal 'Jeep' takes a mobile welder to out-of-the-way locations. With power take-off, the 'Jeep' also operates compressors, generators, drills and winches.

Transportation. The 4-Wheel-Drive 'Jeep' Truck transports men, tools and equipment between mines or wherever they're needed. Keeps maintenance service and supplies moving smoothly.

'Jeep' 4-Wheel-Drive vehicles are proving their value and versatility every day in every phase of the mining industry. From exploring or prospecting in remote areas to keeping maintenance work and service moving smoothly, they demonstrate their versatility. With the extra traction of their 4-wheel drive, they haul ore trailers in trackless mining — up steep inclines, or over rocky ledges. And for travel on good roads they shift easily into 2-wheel drive. Versatile 4-Wheel-Drive 'Jeep' vehicles pay for themselves in a short time because of their adaptability to many jobs, economical performance, long life and low maintenance costs. See your 'Jeep' dealer or write for information.

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It's MineVent Flexible Ventilation Tubing--Of Course!
THIS 36" dia. MineVent Tubing with patented Snap-on Coupling and Type B Hangers is bringing fresh air to the working face in this non-metallic mineral mine. MineVent is preferred for all underground mining because it is light in weight; abrasion, moisture and corrosion resistant; easier to couple, hang or store. Also, Neolon Tubing has all the qualities of MineVent plus lighter weight and utmost tear resistance. Send for samples and catalog.
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Camtactor Control Can Be Supplied
Excellent performance and low maintenance cost cause these locomotives to be preferred the world over. If you want to reduce your Tramming cost, buy an Atlas.
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Africa *(Continued)*

30's and Nigel GM, once one of the Rand's richest, closed after operating steadily from 1888.

South West Africa Co. has countered declining lead-vanadium concentrate output with stepped-up production from the massive lead-zinc sulphide orebody. During the June quarter 964 tons lead and 1,731 tons zinc were recovered. Drilling indicates a 50-ft thick orebody below the 1,000 ft level.

Argent Lead and Zinc mine, near Delams is recovering lead and zinc, with original plans for 5,000 tpm ore treatment. Mine, located in the Eastern Transvaal not far from the new Kinross goldfield, will step up production if prospecting results warrant. Lead concentrates will probably be treated locally and the zinc exported.

IN THE FAR EAST

INDIA

A year after it first started the proposal to nationalize the British owned Kolar Gold Mines has been approved by the Indian Government, provided the State of Mysore presents a bill before the Mysore legislature.

Government also suggested that $2,499,000 is a more reasonable price than the $1,702,000 offered by Mysore. The suggested bill is now before the legislature and the owners of Kolar will have a chance to defend their claim that this seizure is illegal.

Two US experts will soon complete their fact-finding survey to assess the quality of bauxite ore, recently found in Sheveroy Hills, Madras.

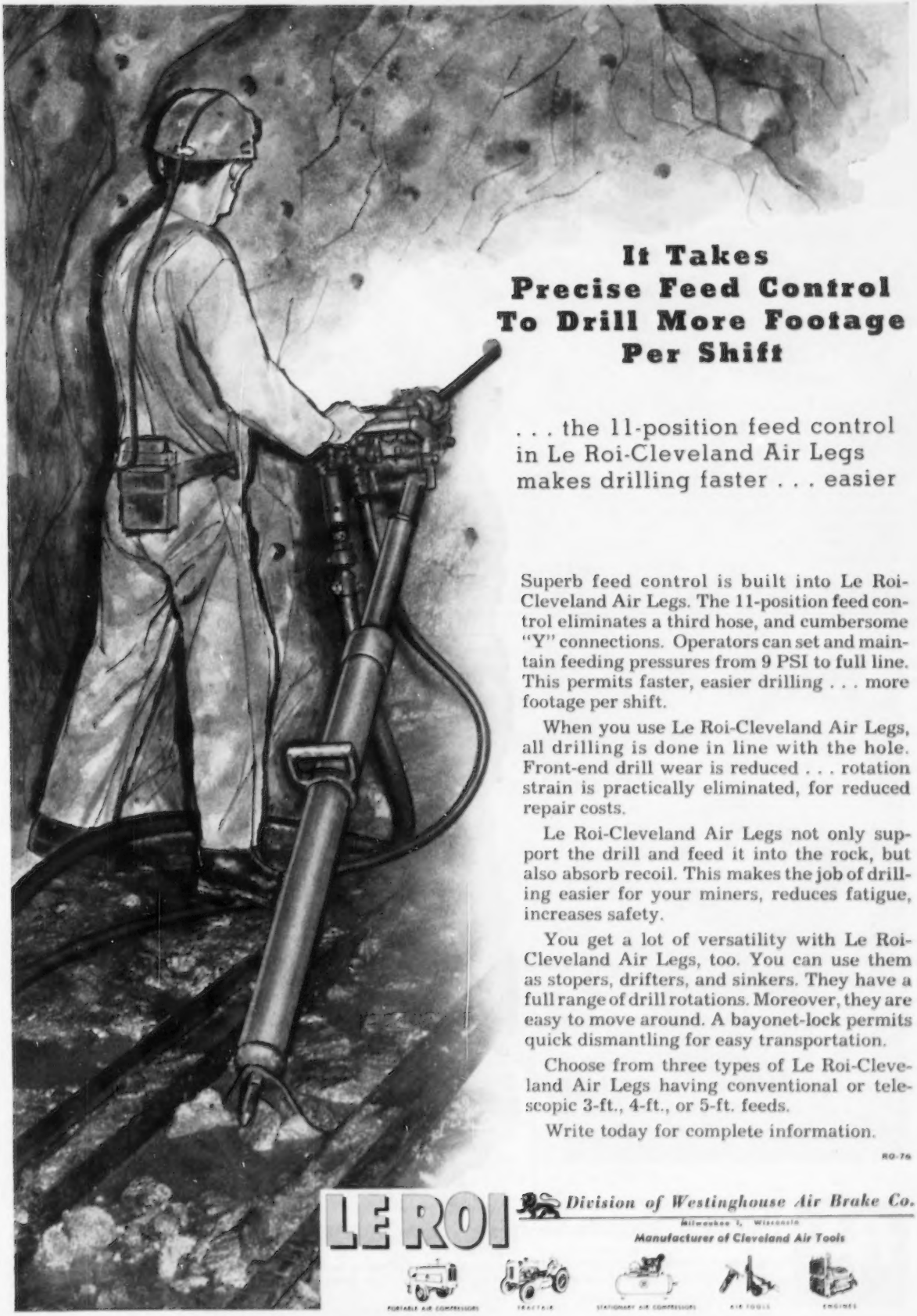
Ore is said to be available in a 500-acre area 25 miles from the town of Salem, which is proposed to be industrially developed. Five tons of representative samples are being collected from various points for transmission to the US for examination.

According to Government officials here, it is proposed, meanwhile, to conduct core drills survey to examine the ore at greater depths and in greater detail. On the result of this examination and on the report of US consultants will depend the future of a $30-million Indo-Canadian aluminum plant project.

Ore, say personnel of Geological Survey of India, is of fine quality. It is further claimed that nearly 7-million tons of bauxite can be made available from this tract, sufficient to last for over a hundred years.

JAPAN

The Mitsui Mining & Smelting Co. has recently signed a contract with Yip In Tsoi & Co., a Thai mining and trade company run by an influential overseas Chinese in Bangkok, for establishment of a joint-managed company for mining



It Takes Precise Feed Control To Drill More Footage Per Shift

. . . the 11-position feed control in Le Roi-Cleveland Air Legs makes drilling faster . . . easier

Superb feed control is built into Le Roi-Cleveland Air Legs. The 11-position feed control eliminates a third hose, and cumbersome "Y" connections. Operators can set and maintain feeding pressures from 9 PSI to full line. This permits faster, easier drilling . . . more footage per shift.

When you use Le Roi-Cleveland Air Legs, all drilling is done in line with the hole. Front-end drill wear is reduced . . . rotation strain is practically eliminated, for reduced repair costs.

Le Roi-Cleveland Air Legs not only support the drill and feed it into the rock, but also absorb recoil. This makes the job of drilling easier for your miners, reduces fatigue, increases safety.

You get a lot of versatility with Le Roi-Cleveland Air Legs, too. You can use them as stopers, drifters, and sinkers. They have a full range of drill rotations. Moreover, they are easy to move around. A bayonet-lock permits quick dismantling for easy transportation.

Choose from three types of Le Roi-Cleveland Air Legs having conventional or telescopic 3-ft., 4-ft., or 5-ft. feeds.

Write today for complete information.

RO-76

LE ROI *Division of Westinghouse Air Brake Co.*

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Manufacturer of Cleveland Air Tools

HERE'S PROOF OF REAL DRILLCO BIT PERFORMANCE

The illustrated EX Standard Drillco Diamond Impregnated Bits were used in exploratory drilling in *Green Stone, Iron Ore* and *Jasper*. Using a standard drill rig with either hydraulic or screw feed, a total of 2647 feet was drilled with the bits pictured above, to obtain an average of 32¢ per foot. Here is proof of the economical drilling obtainable with DRILLCO Diamond Impregnated Bits.

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Instrument size: 3 x 5⅞ x 2½ inches
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Japan *(Continued)*

tungsten and tin in southern Thailand.

The company is expected to ask the Foreign Investment Council of the Japanese Finance Ministry for authorization of the joint project.

The Thai firm proposed joint development of southern Thailand's tungsten and tin resources to the Mitsui Mining & Smelting Co. in May 1953. The Japanese company sent an investigation team to Thailand at that time, and decided after an on-the-spot survey to accept the Thai offer.

Details of the development plan are as follows:

1. The Mitsui and Yip companies will establish a joint-managed company, to be incorporated in Thailand, as soon as possible for developing metal mines in Thailand. This will be capitalized at 18-million bahts ($900,000), with 49% of stocks underwritten by Mitsui and 51% by Yip.

2. The projected company will develop, for the time being, Khao Kiam Mine (tungsten), Wang Phra Mine (tungsten), Sin San Mine (tungsten and tin) and Na Mon Mine (tin), all owned by Yip In Tsoi & Co.

3. The joint company will be inaugurated on Sept. 1.

Mitsui is expected to send 10 technicians to Thailand within the year.

MALAYA

Japanese financiers are showing a growing interest in investing in Malayan iron ore mining and have offered to provide engineers, technicians and machinery for a joint Malay-Japanese company in the State of Kelantan.

Kelantan is reputedly rich in iron ore and several Japanese companies operated there pre-war. If proposals materialize, the Japanese have offered to subscribe up to 45% of company's capital.

New company will be known as Eastern Minerals Trading Co. and will be managed by Malays who will hold controlling shares.

Promoters have acquired leases for ore-bearing land in Gual Priok and Bukit Batu Besar in Tanah Merah, a spokesman for the company stated. Gual Priok has been prospected and proved to contain manganese.

Federal Government has approved formation of a company for joint development of Temangan iron ore mines in Kelantan, North-East Malaya, according to the Kokan Mining Co.

To be known as the Oriental Mining Co., it will have a capital of $1.5-million Strait, said a Kokan spokesman. Kokan will invest 49% of the capital, mainly in machinery and mining equipment. Two British companies, Andrew Weir and Boustead, will hold the other 51%.

Kokan spokesman said that new mine would supply 300,000 tons, 48% iron ore in 1958, and hoped to increase this to 500,000 tons yearly after 1959. Three leading Japanese steel mills are behind

Idarado Mining Co. reports:

12 84" WEMCO S-H CLASSIFIERS

chosen by the White Pine Copper Company

One of 12 Wemco S-H Classifiers installed by White Pine Copper Co. at White Pine, Michigan following testing in their company pilot plant. Mining and processing operations for this large project were designed and engineered by the Western Knapp Engineering Company, division of Western Machinery Company.

With annual production of 75 million pounds, White Pine ranks as one of the most important copper projects developed. To serve as a vital part of the primary grinding circuit, White Pine selected twelve 84" Wemco S-H Classifiers. Typical of the magnitude of this project is the fact that these 84" units are the world's largest simplex classifiers.

Six pairs of Wemco S-H Classifiers are operated in closed circuit with six ball mills, 12' 6" x 13' in size. The minerals recovered are chalcocite and minor amounts of native copper occurring in sandstone and shale deposits. Each classifier is of the submerged spiral type of design with 84" double ribbon, variable pitch spiral. Inside tank length totals 41' 9". Operating slope is 3¾" per foot.

Each classifier has sand raking loads up to 8000 TPD and overflows feed to flotation at rates up to 1200 TPD. Classifier overflow ranges between 30 and 35% solids (depending on degree of pulp flocculation). Screen analysis of this overflow shows between 2 and 8% plus 100 mesh.

Whether your classifier needs are large or small WEMCO DESIGN offers you these METALLURGICAL AND MECHANICAL ADVANTAGES

- **Greater Overflow Capacity** — up to 25% more effective pool area.
- **Greater Raking Capacity** — up to 100% greater sand conveying capacity.
- **Sharper Separation** — less oversize in the overflow and less undersize in the sands.
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- **Balanced Performance** — various models with a wide choice of tanks and spirals achieve correct performance under any condition.
- **Better Drainage** — drier sand for easier conveying and close-circuiting.

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No Cutoffs, Fewer Bootlegs, Increased Safety with Du Pont Blasting "Team"!

1 **PUTTING "TEAM"** to work in the stopes of Idarado Co.'s lead-copper-zinc mine, Ouray, Colo. — priming 1⅛ x 16 "Gelex" No. 2 with Du Pont MS (millisecond) Delay Electric Cap. With their 19 delay periods (MS-25 to -1000), these caps "fit" whatever shooting pattern the rounds demand.

2 **LOADING PRIMER** into vertical hole. Changing from cap and fuse to electric blasting with Du Pont MS Delays gave greatly improved fragmentation, fewer bootlegs (which gave a safer and more solid back), fewer loose slabs on the hanging wall and no unexploded powder in the muck.

3 **CONNECTING** up round with MS Delays. The Idarado Mining Company also found increased safety through the elimination of smoke from the fuse, thus permitting ample time for exit from the stope before the shot is fired.

4 **RESULTS:** plenty of well-broken rock. Consistently, round after round, Du Pont's dependable team of MS Delays and "Gelex" No. 2 gives excellent breakage, with safer, more solid back, and no dynamite in the muck.

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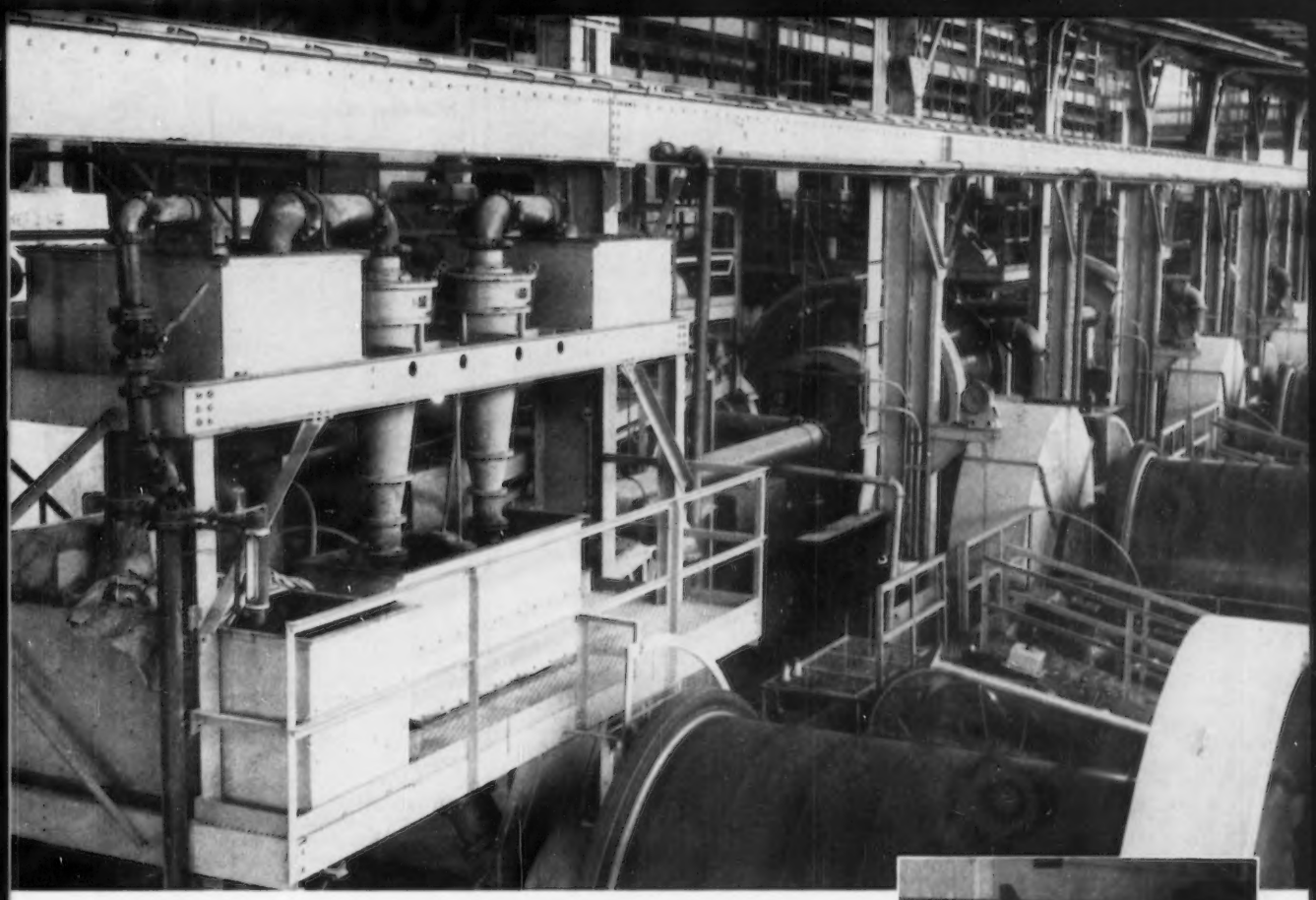

Two model D20 Krebs Cyclones in closed circuit with 9′ x 11′ ball mill

Krebs Cyclones in closed circuit and for sand-slime separation

Two model D20B Krebs Cyclones on the sand-slime separation

Homestake Mining Company uses Krebs Cyclones for closed circuit classification with their new grinding unit and for the sand-slime separation. The cyclones, specially designed for each objective, are low in cost and easy to operate. The new classification techniques give sharper cuts and better percolation rates. Hundreds of model D20, D20B and EE20-9B cyclones are in service and all are operating with the original molded replaceable body liners and long sweep inlet nozzles. Many of these have now handled over a million tons of ore per cyclone.

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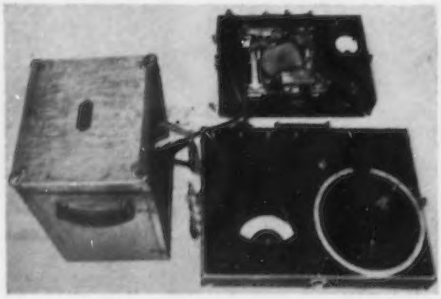
Manufacturers of Krebs Cyclones, Valves and Clarkson Feeders

NEW UNIT for GEOPHYSICAL EXPLORATION SURVEYS



Type A-1 swing current resistance comparator connected to commutator and battery power supply.

This equipment is used for measuring the resistivity of portions of the earth at selected depths by the "WENNER-GISH-ROONEY" four terminal method. (See "Geophysical Exploration" by Heiland, "Exploration Geophysics" by Jakowsky and U. S. Bureau of Standards Paper No. 258). The use of earth resistance measurements for obtaining geophysical and geological data for the purpose of locating ore-bodies; water, oil, sand, gravel, rock, buried metallic and non-metallic objects, cavities, etc., has proven to be very valuable but limited by suitable apparatus for carrying out the tests.
The Type A-1 Resistance Comparator operates from "Swing Current" (send for Bulletin 800 for description) in a patented circuit to produce extremely high sensitivity and immunity from stray earth currents.

BORDEN ENGINEERING DIVISION OF

M. J. JOHNSON AIRCRAFT ENGINEERING CO.

MORRIS PLAINS, NEW JERSEY

Malaya *(Continued)*

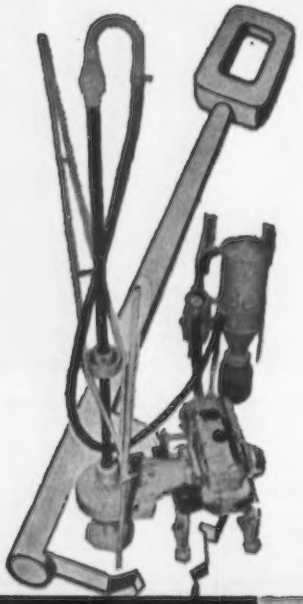
the program, and they are to take over the total production.

Tin prospectors in new and increasing numbers have begun to move into districts cleared of Communist terrorists following easing of the nine year old emergency. Tin industry for the past several years had been clamouring aloud for more land for prospecting but been curtailed due to Government's inability to provide sufficient protection from communist attacks on tin prospectors. Large areas and whole districts have now been declared clear and the Mines Department has approved licenses for prospecting in these areas.

Production of tin has been maintained despite sporadic Communist attacks on lonely mines. Total production of 61,245 tons of tin in concentrates for last year, a slight increase compared to previous year.

76 dredges and 634 gravel pumps are in operation throughout the country. 40% of total production comes from gravel pumps, mainly Chinese-owned, whose enterprise and resourcefulness have been praised in many quarters.

At present seven dredges with a combined capacity of 15-million cubic yards per annum remain closed due to lack of mining land. Of these four are electrically driven, modernised plants and all could be economically operated if mining areas known to exist but closed for one reason or other were made available.



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A PRODUCT OF THE HOUSTON TOOL CO.

IN AUSTRALIA

A 280,000 acres uranium concession in uranium-rich Northern Territory has been purchased by US mining interests.

Cataract Mining Corp., New York, has acquired concession from Rich Uranium Co., Darwin, Australia, and Dallas, Texas. Newly-acquired field adjoins Rum Jungle and the larger of two Australian uranium treatment plants.

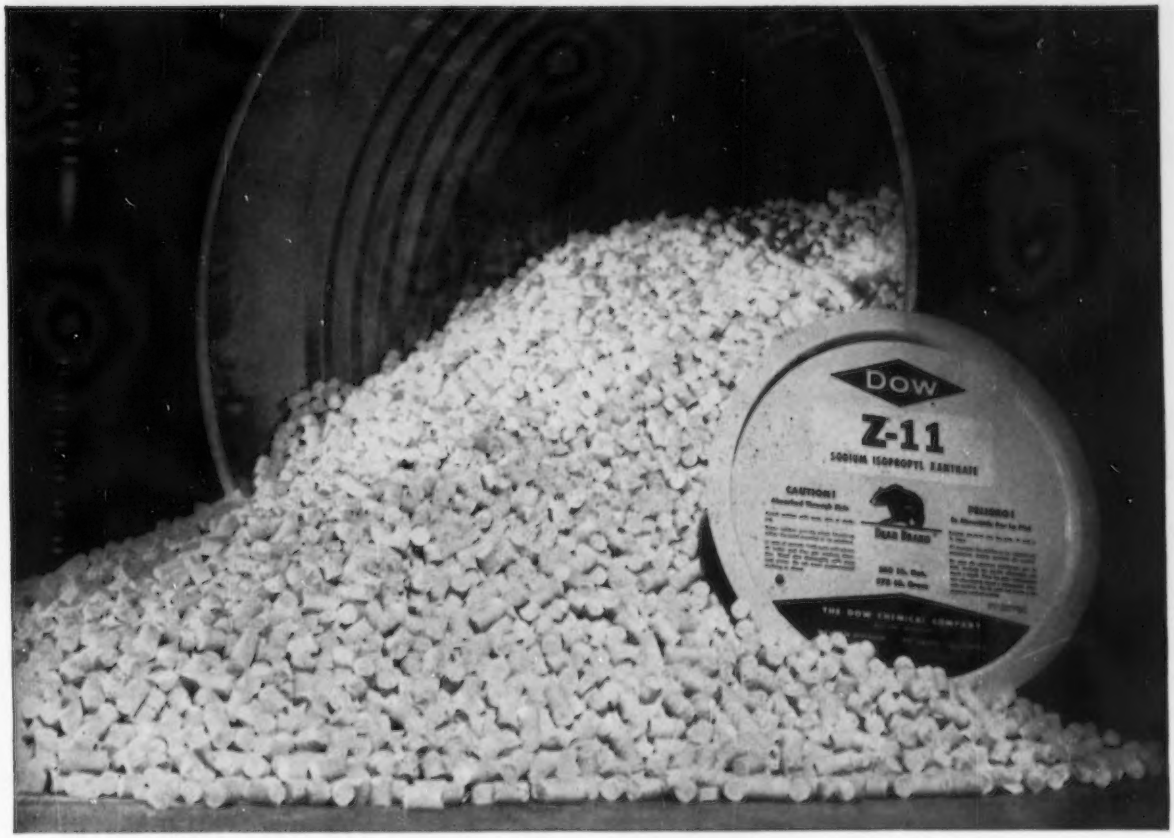
It is understood that northern boundary of concession is only seven miles from Rum Jungle mines and concentrating plant. Darwin is sixty miles away.

Cataract Corp. promises rapid development of the new concession. Extensive drilling program will be started without delay to enable main operations to commence before rainy season sets in late in November. In the absence of disappointing events, Cataract Corp. expects first shipments of uranium ore to Rum Jungle treatment plant by March, 1957.

Surface finds of uranium ore, assaying between 3 and 8% were obtained by Kamen Petroleum Exploration Co., Cisco, Texas, and it is thought that a major extension of the Rum Jungle deposit continues into Cataract concession.

Mt. Morgan Ltd. treated less ore and produced less gold and copper in the year to June 30 than in 1954/55; copper output was 6,840 tons as against previous 7,847 tons and gold output dropped sharply from 63,087 oz to 43,713 oz.

DOW



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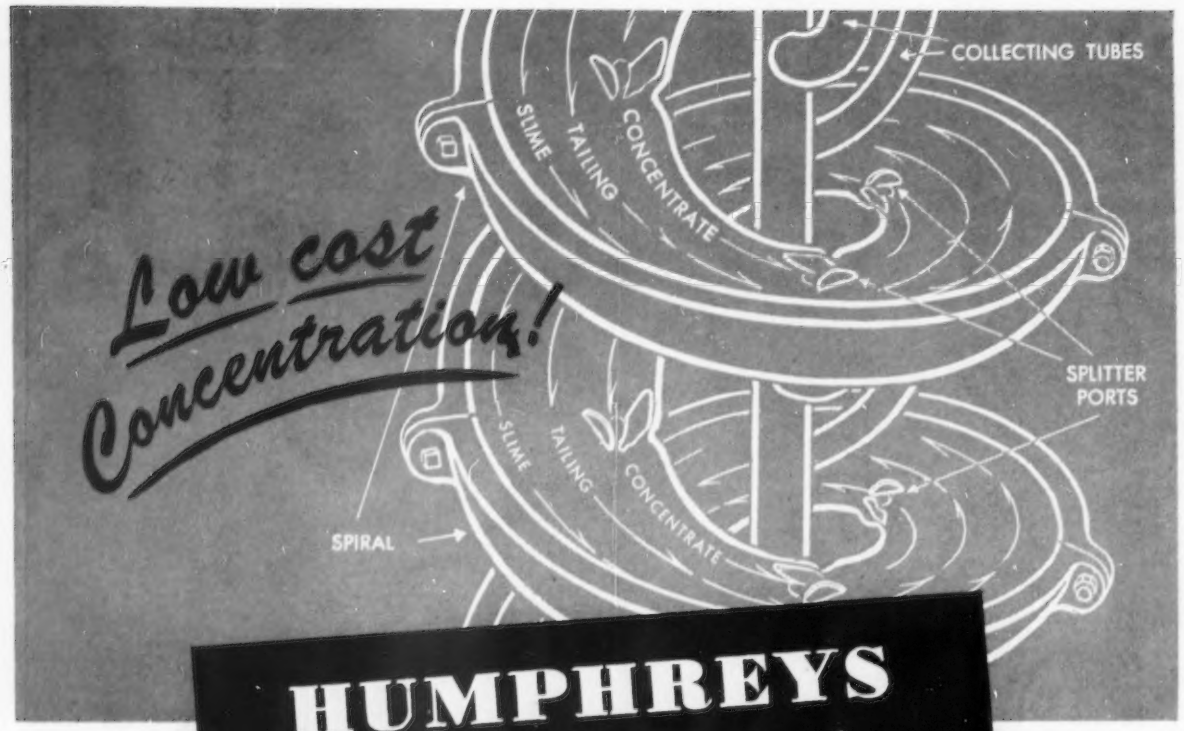

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- Scavenging the tailing from another process for the recovery of heavy minerals not amenable to the primary processes.
- Production of a finished concentrate, with a tailing to be treated by another process.

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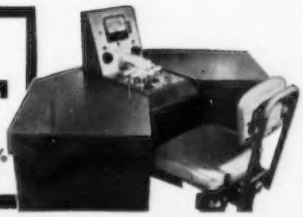

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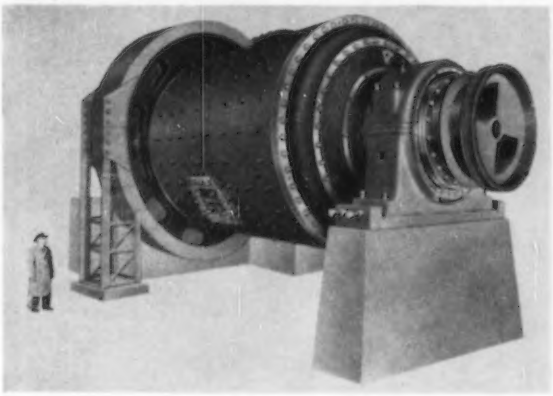
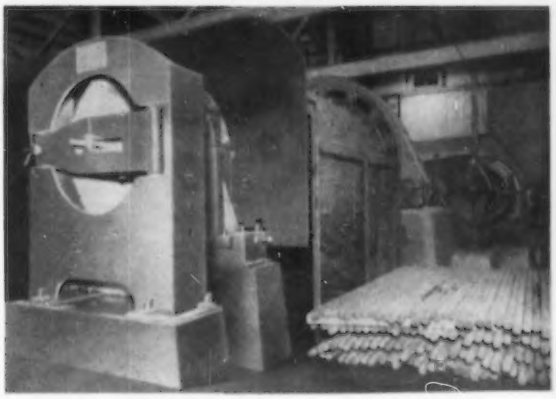
MARCY GRATE DISCHARGE BALL MILLS AND MARCY OPEN END ROD MILLS





Marcy Ball and Rod Mills both incorporate the Marcy principle of grinding..."rapid change of mill content is necessary for high efficiency." This is accomplished by use of the Marcy *full-grate* discharge on ball mills and the *open end* feature on Marcy rod mills. These features result in a low pulp line which provides an active, effective grinding mass to act on particle size reduction only...there is no wasteful cushioning action by high pulp levels. There is a faster migration of fines than oversize particles, thus less overgrinding. This basic principle of grinding incorporated in Marcy Mills has proved, in hundreds of installations, to give greater output with lower KWH per ton, from 25 to 45% more tonnage compared with the same size overflow mills. Marcy Mills are made in sizes up to 12'6" diameter. Every Marcy is backed by more than 40 years grinding experience.

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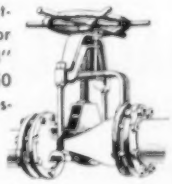

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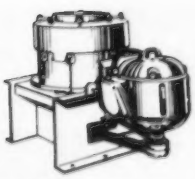

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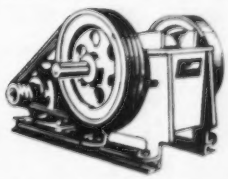

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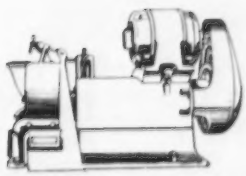

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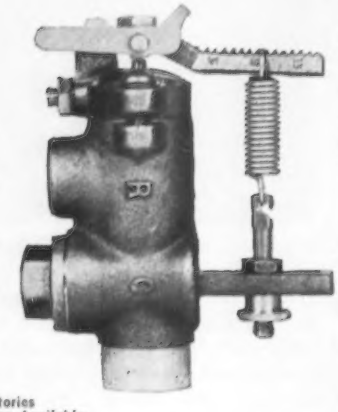

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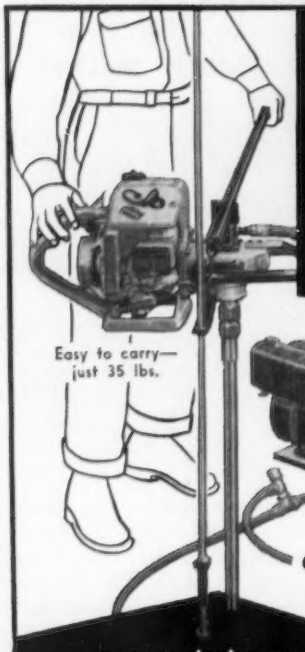

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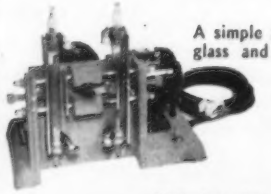

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A Ross Chain Feeder is your guarantee of perfect flow control of ANY size ores or rock . . . from storage bins and open dump chutes to crushers, conveyors, screens . . . anywhere . . . at lowest operation and maintenance cost. Other "Ross" units include Ross Drop-Bar Grizzly Feeder and Ross Two-Roll Grizzly.

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REctor 2-5307

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220 Broadway, New York 38, N. Y.
WOrth 2-2934

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Experiment takes time—so why not save time by calling in a specialist who has already gone over the ground you are now exploring?

Engineering & Mining Journal, meeting place of mining men in all parts of the country, points the way to the solution of many milling problems through its Professional Service Section.

Why not tell one of these specialists about YOUR problems?

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The Advertisements in this section include all employment opportunities—executive, management, technical, selling, office, skilled, manual, etc.

Positions Vacant
Positions Wanted
Part Time Work

Civil Service Opportunities
Selling Opportunities Wanted
Selling Opportunities Offered

Employment Agencies
Employment Services
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The advertising rate is $16.00 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

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Subject to Agency Commission.

$1.50 per line, minimum 3 lines. To figure advance payment count 5 average words as a line.

Position Wanted—The rate is one-half of the above, payable in advance.

Box Numbers—counts as 1 line.

Discount of 10% if full payment is made in advance for 4 consecutive insertions.

Not subject to Agency Commission.

Send NEW ADS or Inquiries to Classified Advertising Div. of ENGINEERING & MINING JOURNAL, P.O. Box 12, N. Y. 36, N. Y. October Issue closes Sept. 21st.

REPLIES (Box No.): Address to office nearest you
% This publication Classified Adv. Div.
NEW YORK: P. O. Box 12 : 36)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

POSITIONS VACANT

Research Metallurgist required for Island of Cyprus. Metallurgical engineer or mining engineer with good training and experience in metallurgy to conduct tests for improving practice in 100 ton per hour mill floating heavy copper sulphide ores and also to conduct tests on grades and mixtures of varying copper content. Aptitude and interest primarily research. Age to 45 years. Three year contract. Salary open. Submit complete record and list of references with first reply. Cyprus Mines Corporation, 523 West Sixth Street, Los Angeles 14, Calif.

Metallurgist wanted by Northwest phosphate company to take over operation of beneficiation pilot plant and carry through this work to full-scale plant operation. Salary open. P-2271, Engineering & Mining Journal.

Senior Geologist, minimum ten years active experience in mining geology, to plan and direct exploration, geologic mapping and studies, and to prepare reports and reserve estimates for major fluorspar producer—southern Illinois. Salary open. Address replies with resume of professional record to P-2816, Engineering & Mining Journal.

Junior Geologist, minimum one year active experience in mining geology, to supervise exploration drilling, do geologic mapping and assist senior geologist—major fluorspar producer—southern Illinois. Salary open. Address replies with resume of professional record to P-2819, Engineering & Mining Journal.

Recent graduate, B.S. in mining or mining geology. Excellent opportunity with growing open pit operation in Southwest. Reply giving full qualifications. P-2799, Engineering & Mining Journal.

To Employers Who Advertise for Men:

The letters you receive in answer to your advertisements are submitted by each of the applicants with the hope of securing the position offered.

When there are many applicants it frequently happens that the only letters acknowledged are those of promising candidates. Others do not receive the slightest indication that their letters have even been received, much less given any consideration. These men often become discouraged, will not respond to future advertisements and sometimes even question if they are bona fide.

We can guarantee that *Every Advertisement Printed in the Searchlight Section Is Duly Authorized.* Now won't you help keep our readers interested in this advertising by acknowledging every application received, even if you only return the letters of unsuccessful applicants to them marked, say, "Position filled, thank you." If you don't care to reveal your identity, mail them in plain envelopes.

We suggest this in a spirit of helpful co-operation between employers and the men replying to Positions Vacant advertisements.

Classified Advertising Division
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Nation wide recruitment through 54 offices of the National Ass'n of Personnel Consultants at no charge to the employer. The Pacific Northwest's leading employment firm.

ACME PERSONNEL SERVICE
P.O. Box 132, Dishman Branch, Spokane, Wash.

POSITIONS VACANT

Assayer-Engineer for isolated field station of Territorial Department of Mines at Nome, Alaska. Must be qualified to do fire and chemical analyses for common ores and make field examinations of mineral prospects. Limited quarters provided at Nome station. Single status preferable due to travel. Position open April, 1957. Salary up to $7,000 per annum depending on qualifications. Contact Territorial Department of Mines, P. O. Box 1391, Juneau, Alaska.

POSITIONS WANTED

Mining Engineer — desires supervisory position, open pit or underground. E.M. degree, 29, family, employed. Six years underground and open pit experience, shift boss, foreman, asst. mine supt., exploration. Familiar operation and maintenance mine and pit equipment, development, stoping, planning, stripping, haulage. Available 30 days. PW-2541, Engineering & Mining Journal.

General Manager, mining. Salary $15,000. Employed. Available thirty days notice. PW-2795, Engineering & Mining Journal.

Metallurgical Engineer, 36, family man. Registered P. E. 9 years experience sales, application and service on variety of ore dressing and processing equipment manufactured by prominent concern in field. Desires responsible and interesting position with young-minded, expanding concern in minerals or chemical field. Will relocate. PW-2846, Engineering & Mining Journal.

Administrative or Managerial position — foreign assignment wanted. Will consider attractive stateside offer. Past five years insurance manager for American Defense Base construction contractor in Canada. Previously insurance underwriting, labor, personnel and securities experience. Familiar with government contracts, preparation and adjustment of insurance and other claims. College graduate — speak Spanish and Italian—37—married. Travel, relocation no object. Resume on request. Write PW-2597, Engineering & Mining Journal.

French Engineer 35, English wife, daughter 6 years. Good experience in production of tin, lead, silicium, ferro-manganese, grey iron, sodium silicate in electric furnace, grey iron and bronze foundry. Employed Central Africa. Contract ends August 1956. PW-9563, Engineering & Mining Journal.

Metallurgical Engineer with extensive experience in top executive positions in the fields of hydro and pyro metallurgy. Age 42, family, now employed. PW-2722, Engineering & Mining Journal.

Graduate Mining Engineer, Veteran, 31, married. 4 years experience mining, milling, ore buying. Desire permanent responsible position with progressive organization. Will travel. PW-273*, Engineering & Mining Journal.

Graduate Mining Engineer, 37, Canadian, family, employed as assistant superintendent of industrial mineral plant. Experienced in general engineering, drafting, surveying, administration, plant economics; some exploration. Interested in production supervision with managerial possibilities. Prefer locate south or west. PW-2734, Engineering & Mining Journal.

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Our Metals, Refinery and Industrial Divisions offer you wide choice of opportunity to make fullest use of your talents in the design of refineries, blast furnaces, steel, sintering, chemical and industrial plants and their auxiliaries.

Investigate the advantages of top compensation, ideal working conditions, employment security, advancement opportunity and many generous benefits available to you at McKee.

Telephone TOwer 1-2300, Cleveland, Ohio or write to Edward A. Kolner, Arthur G. McKee & Company, 2300 Chester Ave., Cleveland 1, Ohio

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Engineering offices in
CLEVELAND, OHIO • UNION, N.J. • TORONTO, ONT.

Your inquiry will have Special Value . . .

If you mention this magazine, when writing advertisers. Naturally, the publisher will appreciate it . . . but, more important, it will identify you as one of the men the advertiser wants to reach with this message . . . and help to make possible enlarged future service to you as a reader.

Additional Employment Advertising on following page.

EMPLOYMENT OPPORTUNITIES

(Continued from preceding page)

South American Positions

ASSISTANT GENERAL MILL FOREMEN.
MASTER MECHANIC for Smelter Operations.
ASSISTANT MINE FOREMEN for underground mine operations. Salary $450.00/month.
DIAMOND DRILL FOREMEN for development/exploration. Salary $550.00/month.
FIELD ENGINEER for design drafting in connection with Smelter maintenance and repairs, camp buildings, water line, etc. Salary $600-650/month.
INDUSTRIAL ENGINEER at least five years experience in production control, time study, wage incentive, job evaluation, etc. Salary $9,000/yr.
FIELD ELECTRICAL ENGINEER to supervise work done by District Electrical Foremen in various Company-owned villages, Mine, Concentrator, Smelter and miscellaneous jobs, which include all electrical equipment used in the Plant with its auxiliary services and covers power distribution and utilization. Salary $750.00/month.
SUPERINTENDENT, Construction and Maintenance Department—registered professional engineer with considerable U. S. Construction experience, capable of supervising all major construction, repairs and maintenance of housing and commercial structures in several camps. Salary $12,000 per year.
Large Copper Company Chile, South America. 3-year contract. Transportation both ways and salary while traveling paid by company. Good opportunities. In reply give complete details.

P2672 Engineering and Mining Journal
Class. Adv. Div. P.O. Box 121 N.Y. 36, N.Y.

ELECTRICAL—MECHANICAL
SUPERINTENDENT
SOUTH WEST AFRICA

Applications are invited for position of Electrical-Mechanical Superintendent in South West Africa for large base metal mining and milling operation, including modern 14,000 KVA steam and diesel plant, 50,000 tons per month concentrator, AC and DC hoists, underground pumping plants, complete shops, oxygen plant and other machinery.
Applicant should be a graduate electrical engineer and have considerable practical and supervisory experience in plant operation and maintenance. Ideal climate with excellent living conditions. Apply to P2662 Engineering and Mining Journal Class Adv. Div. PO Box 12, NY 36, NY stating age, marital status and experi-experience.

PROJECT ENGINEER WANTED

Graduate Mining, Metallurgical, Chemical or Mechanical Engineer, preferably 25 to 35 years old, wanted by medium size progressive heavy machinery manufacturing company located in Southeastern Pennsylvania. To assist in design and preparing for market of various lines of equipment used in mineral dressing, heavy chemical, cement and rock products industries. Must have had engineering and field experience, and be willing to work on drafting board, travel and do field service. Opportunity also exists for a properly qualified individual, eventually to become a sales engineer. Salary open.

P-7533 Engineering & Mining Journal
330 W. 42nd St., New York 36, N. Y.

RESEARCH ENGINEER

For development of mineral west products. Chemical, Metallurgical or Ceramic Engineering degree; three to five years' experience in process industry, background in combustion and thermodynamics. Age preference 30-40. Salary $7,000 - $10,000, based on experience. Send complete resume.

P2570 Engineering and Mining Journal
Class. Adv. Div., P. O. Box 12, New York 36, N. Y.

SEARCHLIGHT SECTION

(Classified Advertising)

BUSINESS OPPORTUNITIES — **EQUIPMENT - USED or RESALE**

RATES

UNDISPLAYED

$1.50 a line, minimum 3 lines. To figure advance payment count 5 average words as a line.

BOX NUMBERS count as one line additional in undisplayed ads.

DISCOUNT of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

DISPLAYED

The advertising rate is $13.80 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.
AN ADVERTISING INCH is measured ⅞ inch vertically on one column, 3 columns—30 inches—to a page.
EQUIPMENT WANTED or FOR SALE ADVERTISEMENTS acceptable only in Displayed Style.

Send New ADS or Inquiries to Engineering & Mining Journal, P. O. Box 12, N. Y. 36, N. Y. for October issue closing September 21st.

BUSINESS OPPORTUNITIES

900 acres proven manganese lands in heart of Batesville-Cushman quadrangle. High production now. Will sell; might lease. Write, Bee Vanemburg, Owner, Batesville, Arkansas.

30 Uranium claims for development or sale. Wyo.- Utah state line. Surface assays to .137. AEC geologist reports. Contact E. F. Gits, 1819 Marshall Ave., Saint Paul 4, Minnesota.

Mexican Mining properties. 2323 Arizona St., El Paso, Texas.

80,000 Tons Fine Tin need concentrator with capital for 300 or 500 tons daily plant; to work richest stream bed deposits, with average 10% material, accordance report No. 30 of metal reserve dept. on Ocuri Tin Placer, October 6, 1943. (Warfare) Location: Near Oruro, Bolivian Government guarantees new investments to the U.S. Gov., and the latter to the Capitalists. Object: Partner basis—or—sale of entire Lode. Details of future advantageous terms from Bolivian Government at your request. Eduardo Martin, 1842 Dario Urzua St. Santiago de Chile. (South America).

OPPORTUNITIES TO INVEST IN CUBA

Wish to contact investors for $100,000.00 to share in a Company to be organized with cuban-american management for the exploration of minerals, manganese, iron, chrome, copper, uranium, bauxite, etc. so badly needed by the United States. Another enterprise needs $200,000.00 to construct a dock in Oriente Province to provide shipping facilities to a vast zone of minerals undeveloped for lack of it. Government has already granted concession. Write to:

Y. Galan
P.O. Box 336, Havana, Cuba

ATTENTION: Manganese & Quarry Operators
USED EQUIPMENT BARGAINS

1—Eagle 7' x 30' Log Washer, model BM-D2562.
1—Eagle Pyramidal-type Water Scalping Tank, model 610.
1—Denver Crusher, Type "H", 10" x 16".
1—Denver Crusher, Type "H", 8" x 10".
1—Denver Crusher, Type "H", 5" x 6".
2—Denver Horz. Type Jigs, 3-18" x 32" compartment size.
2—Denver Duplex Mineral Jigs, 16" x 24" (Center Drawoff Wells provided).
1—Denver-Wilfley Concentrating Table, Denver model D-C.
1—Denver 21" Automatic Sampler.
1—Pioneer Conveyor, S.S.K.D. AFB, 18" x 15'.
1—Pioneer Conveyor, S.S.K.F. AFB, 18" x 23'.
1—Pioneer Revolving Screen, 36" x 10'.
1—Allis-Chalmers single-deck Low-Head Vibrating Screen, 5' x 10'.
1—Pioneer Roll Crusher, 24" x 16".
1—Pioneer Heavy-Duty Scalping Screen, single-deck Mesabi, model 1951, 4" x 10'.
NOTE: V-Belt Drives, Electric Motors, and motor mounts available for all equipment listed above.
1—Gardner-Denver Pump, 7½ x 10, model FYFXDE with General Electric motor, model 84, 220-v. 3-phase, 60-cycle, 100 h.p. & De Ion Line Starter.

All items subject to prior sale.
Call, Write or Wire for Details.

BEMISS EQUIPMENT CORPORATION
224 W. FOURTH STREET, SALEM, VIRGINIA
Phone 5461

FOR SALE
ENTIRE QUICKSILVER PROPERTIES

including approximately 100 acres of patented land, complete with 40-Ton rotary furnace plant, living quarters, cookhouse and other buildings and equipment in good condition.

LOCATED on the Eastern slope of the North Peak of Mt. Diablo, 50 miles from San Francisco.

PRODUCED over 12,000 flasks since 1936. Only a small part of the property has been explored.

INQUIRIES—address V. Blomberg, P. O. Box 133, Clayton, California.

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$6.50 postpaid in the United States
6.75 postpaid in Canada and Mexico
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On request, will be sent on approval.

SCRAP TUNGSTEN CARBIDE ROCK BIT INSERTS

are regularly purchased by Macro Tungsten Refinery. For our quotation F.O.B. shipping point, write

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Long or short term charter, U. K. and overseas. Engineering and operating assistance also offered to Companies purchasing own aircraft.

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For Sale

New, in original packing case, Model 1R—40, complete with shank and bit punch, shanking devices, dies, dollies, punch pins and various other parts. Priced at approximate half of present cost. Packed for export.

FB9085 Engineering & Mining Journal
330 W. 42nd St., New York 36, N.Y.

WANTED

Cement Copper from Mining operations
and
Impure Nickel Salts from Copper refining.
Principals or their agents only.
Interested making long term commitment.

NEW JERSEY METALS CO.
712 Rockefeller St. Elizabeth, N. J.

WANT TO BUY
DIESEL LOCOMOTIVES & CRANES
ROTARY DRYERS & KILNS
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60 E. 42nd St., New York 17, N.Y.

SINCE 1898 DEPENDABLE RECONDITIONED MACHINERY

BATTERY LOCOMOTIVES

1—4 ton Westinghouse 24" gauge
1—4 ton Ironton, 36" gauge
2—6 ton General Electric
2—7 ton General Electric, 36" gauge, permissible
1—7 ton Atlas, 36"-48" gauge
2—8 ton General Electric 36" gauge
2—8 ton Goodman, 36" gauge
3—8 ton Ironton, 24"-48" gauge
4—10 ton Atlas, 36" gauge

TROLLEY LOCOMOTIVES

1—4½ ton Goodman, 36" gauge
1—5 ton Jeffrey, 36" gauge
2—5 ton Jeffrey, 42" gauge
1—6 ton Goodman, 36" gauge
1—6 ton Goodman, 42" gauge
2—8 ton Goodman, 42" gauge
3—10 ton Jeffrey, 42" gauge
1—13 ton Goodman, 42" gauge
1—13 ton Jeffrey, 42" gauge
3—15 ton Jeffrey, 42" gauge

FILTERS

2—4' x 2' Morse Drum Filters
1—3' x 4' Oliver Drum Filter
1—4' x 8' Eimco Drum Filter
1—6' x 8' Morse Drum Filter
1—4' — 2 disc Denver Leaf Filter
1—6' — 2 disc American Leaf Filter
1—6' — 2 disc Oliver Leaf Filter
1—6' — 5 disc Morse Leaf Filter
1—18" Morse Filter Press
1—36" Sweetland #12 Filter Press

SLUSHER HOISTS

1—Joy 15 h.p. double drum slusher Model AF-212
1—Joy 15 h.p. double drum slusher Model AAF-212
1—Joy 10 h.p. 3 drum slusher
1—Sullivan 2 drum slusher Model HD-10-B, gas engine driven

HOISTS

1—10 HP Vulcan #0 Single Drum
1—15 HP Box Single Drum
1—20 HP H&B Single Drum
1—22 HP Vulcan Single Drum #1½
1—30 HP Vulcan Double Drum
1—30 HP Vulcan Single Drum
1—37 HP Single Drum
2—52 HP Vulcan #4½ Single Drum
1—50 HP Fairbanks-Morse Single Drum
1—60 HP Vulcan #23 ELF Single Drum
4—100 HP Box Single Drum
2—112 HP Vulcan Single Drum
3—125 HP Ottumwa Single Drum
2—150 HP Vulcan Single Drum
1—22 HP Vulcan #1½ Double Drum
1—75 HP Vulcan Double Drum
1—25 HP domestic Two Drum Contractors' Type
1—40 HP Thomas Single Drum Contractors' Type
1—40 HP American 3 Drum
1—80 HP Thomas 3 Drum
1—60 HP Lidgerwood

AIR TUGGER HOISTS

4—Ingersoll-Rand Model D6U
7—Gardner-Denver Model HK
1—Sullivan Model L111
2—Joy Model F113
1—Ingersoll-Rand Model EU
1—Gardner-Denver Model HM

CRUSHERS

4—2½" x 3½" New Morse Lab Jaw Crushers
4—4" x 6" New Morse Lab Jaw Crushers
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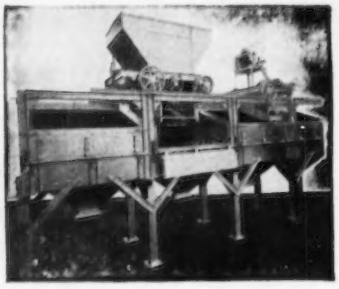

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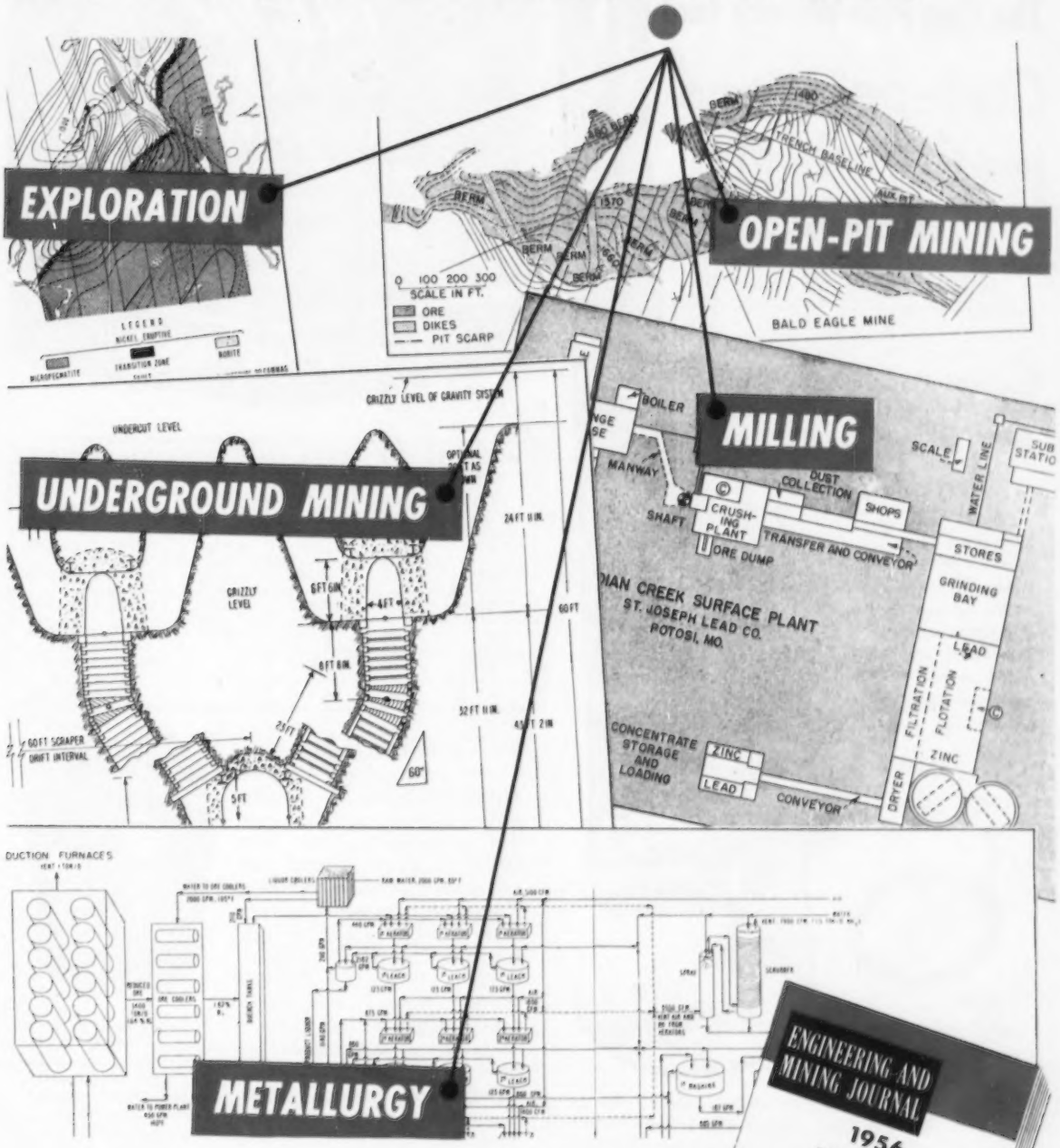

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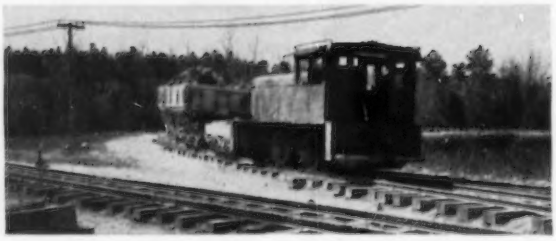
George Atchison (left), engineer, and J. G. McVay, superintendent, with Caterpillar-powered Vulcan locomotive owned by Lone Star Cement Co. of Jackson, Ala.

TORQUE CONVERTER SMOOTHNESS + DIESEL FUEL ECONOMY = BIG SAVINGS FOR LONE STAR

Lone Star Cement Co. of Jackson, Ala., installed Caterpillar D318 Torque Converter Power Units in two 12-ton Vulcan locomotives, replacing gasoline engines with conventional transmissions. Let J. G. McVay, superintendent, tell the story: "With these CAT* Diesels, we've gotten away from a lot of costly transmission repairs and maintenance. And we used to burn 22 gallons of gasoline in an eight-hour shift. Now we use only 10 gallons of fuel oil per eight hours—a big saving to us."

The two locomotives make 40 to 45 round trips per day over the two-mile track from pit to loading conveyor. They haul six cars, each loaded with seven tons of limestone and clay, up a two per cent grade. A Caterpillar Engine with torque converter is ideal here. Engine power is smooth and oil-cushioned, moves off with big loads quickly, and climbs grades without shifting.

The Caterpillar D318 is a 137 HP (maximum output capacity) diesel that operates on money-saving, non-premium furnace oil. Thanks to its four-cycle design, there are no cylinder ports or air boxes to clean. And its large-orifice, Caterpillar-built fuel injection system means that the engine will not foul, even when idling for extended periods. With such Caterpillar features as "Hi-Electro" hardened cylinder liners and crankshafts, aluminum-alloy bearings and highly effective oil, air and fuel filters, this rugged yellow engine is built to stay on the job and out of the shop.



There's a full line of Caterpillar Torque Converter Power Units up to 650 HP (maximum output capacity). Leading manufacturers can supply mining equipment with Caterpillar power. And your Caterpillar Dealer can install a Cat Diesel if it's time to repower. Discuss your engine needs with him soon—and count on him whenever you need skilled service or parts you can trust.

Caterpillar Tractor Co., Peoria, Illinois, U.S.A.

CATERPILLAR*

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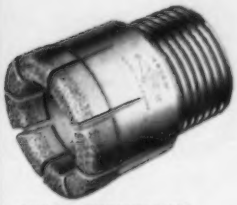
MODERN HEAVY-DUTY POWER

TRUCO CORING BIT

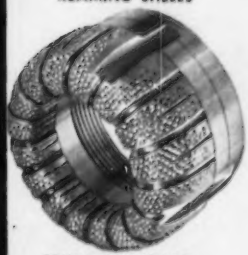
TRUCO CONCAVE BLAST HOLE BIT

TRUCO PILOT BIT

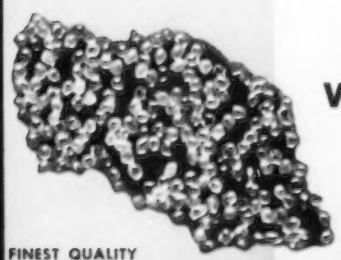


TRUCO IMPREGNATED CORING BIT

TRUCO REAMING SHELLS



TRUCO STANDARD OIL FIELD BIT



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1910 *Our 46th Anniversary* **1956**

the 20 horsepower miracle

Pioneering was fashionable in Detroit 46 years ago and we, with our pioneer idea of expertly selected industrial diamonds, had lots of company and customers among the new car and truck builders who were springing up at the average (and incredible) rate of half-a-dozen a month.

And, if we needed inspiration and encouragement in our early business years (and sometimes we did) it was right at hand in the social and industrial miracle of one little car that had been launched with an idea just as pioneering as our own.

Until then, horseless carriages had been for the rich. This car was for the common man. It was light, simple, cheap ($1100 for the Town Car in 1910; $260 for the Roadster in 1924) and—indomitable. With a spunky little four cyinder, 20 horsepower engine, it performed impossible feats of transportation and endurance.

Originally, production had been hopefully set at 25,000 cars for the year but in the twenty years of its existence, more than 15,000,000 were built and they changed the pattern of daily life all over the world.

Cars have changed vastly in our time and so have drilling techniques and we have seen our Truco Engineered Diamond Bits develop from a long-past experiment to a world-wide success, acknowledged throughout the drilling industry because of their irresistible cutting power in any formation and because they save rig time and reduce footage costs. May we send you the Truco Diamond Bit Catalog?

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See Our Exhibit at Booth 615,
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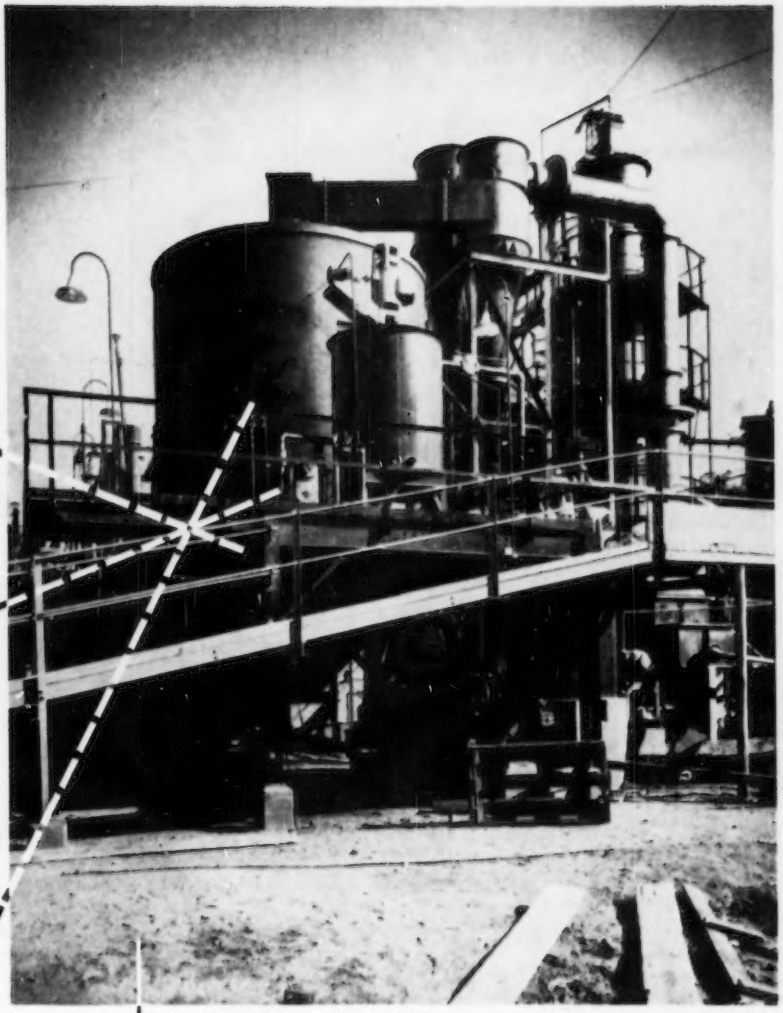
IN SOUTH AFRICA

AROUND THE CLOCK

A TANK CAR AN HOUR OF H_2SO_4



This FluoSolids System at West Rand Consolidated Gold Mines, Ltd. on South Africa's fabulous Witwatersrand was started up early in 1952. The first of several to go into operation on the Rand, it was also the first in the world to combine FluoSolids roasting of pyrite with a contact acid plant.

Over 1650 tons of H_2SO_4 — enough to fill twenty-four tank cars — are being produced every day for uranium leaching at seven South African mills.

An important part of each of these installations is a Dorrco FluoSolids System. Cumulatively the Systems include nineteen Reactors, of which sixteen were on original order and three on repeat orders, plus additional Dorr-Oliver and auxiliary equipment to produce a high strength SO_2 gas for acid manufacture by conventional contact acid plants.

Total feed to the Systems is 1450 tons per day of pyritic gold mill tailings — averaging 35 to 45% total sulfur, gas production is 75,000 to 82,000 SCFM. Gas strength averages 12 to 13% SO_2 . . . sulfur recovery approximately 90%.

The efficiency and economics of the Dorrco FluoSolids System is in evidence in these facts. Additional representative proof that the FluoSolids process can produce an SO_2 gas at lower investment and operating costs than other roasters.

If there's a step in your flowsheet where intimate contact between solids and gases is essential, fluidization should be investigated. Just drop a line to Dorr-Oliver Incorporated, Stamford, Connecticut.

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